

T H E
M E D I C A L W O R K S
O F

RICHARD MEAD, M. D.

Physician to his late Majesty K. GEORGE II.

Fellow of the ROYAL COLLEGES of PHYSICIANS
at LONDON and EDINBURGH, and of
the ROYAL SOCIETY.

With an Account of the LIFE and WRITINGS
of the AUTHOR.

IN THREE VOLUMES.

E D I N B U R G H.

Printed by A. DONALDSON and J. REID.

For ALEXANDER DONALDSON, and sold at
his shops in *London* and *Edinburgh*.

MDCCLXV.

THE
MEDICAL WORKS

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MDCCLXII

T H E
M E D I C A L W O R K S
O F
D R R I C H A R D M E A D .

V O L U M E I .

C O N T A I N I N G

A M E C H A N I C A L A C C O U N T o f P O I S O N S ; A
T R E A T I S E c o n c e r n i n g t h e I n f l u e n c e o f t h e S U N
a n d M O O N u p o n H U M A N B O D I E S , a n d t h e
D I S E A S E S t h e r e b y o c c a s i o n e d ; O R A T I O A N N I -
V E R S A R I A H A R V E I A N A , e t J O A N N I F R E I N D ,
E p i s t o l a , b o t h w i t h T r a n s l a t i o n s ; D r B O N O M O ' s
O b s e r v a t i o n s c o n c e r n i n g t h e W O R M S o f H U -
M A N B O D I E S ; a n d , A n a c c o u n t o f t h e H Y -
D R O P H O B I A .

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M D C C L X V .

THE
MEDICAL WORKS
OF
DR. RICHARD MEAD

CONTAINING

A Mechanical Account of the
Turbulence concerning the influence of the Sun
and Moon upon Human Bodies; and the
Diseases thereby occasioned; ORATIO ANN.
VERBISIA HABITA IN JOHANNI KEILN.
Epistolæ de viribus in Bononiæ
Observationes de morbis
MAN BODIES; and of the
PROPHETIA.



Printed by A. Dorrington, at the
for Alexander Dorrington, and
in the Strand, near the
MDCCLXX.

MEMOIRS of the LIFE and WRITINGS of the AUTHOR.

DR RICHARD MEAD was descended from a considerable family in Buckinghamshire, and born at Stepney, a small village near London, in August 1673. His father, Mr Matthew Mead, was a celebrated divine among the nonconformists, and had been one of the two ministers of that parish; but was ejected in 1662. He had a very numerous family; yet, having a handsome fortune, he educated his children liberally, and kept a private tutor in his house for that purpose.

Party-rage running high at the end of Charles II.'s reign, Mr Mead became obnoxious, and was forced to withdraw himself. He went into Holland, after having placed his son Richard at a school, under Mr Singleton, an able master of his own principles. Here he made a great progress in every thing which belonged to the belles lettres; and, in the year 1689, was sent to Utrecht, to complete those studies under the illustrious Grævius, to whom he was recommended by his eldest brother, who had also been his pupil.

After three years residence at Utrecht, he went to Leyden; and being determined to dedicate himself to the study of physic, he attended Herman's botanical courses, and the famous Pitcairn's lectures on the theory and practice of physic. Pitcairn was very reserved out of college; nevertheless, our young student insinuated himself so far into the good graces of this professor, that he drew from him several obser-

vations, of which he afterwards made good use in his writings, but never without acknowledging to whom he was indebted for them.

His academical studies being finished, he set out upon his travels to Italy, in company with his eldest brother Mr Samuel Mead, David Polhill, Esq; and Dr Thomas Pellet, afterwards president of the college of physicians at London. In Italy he met with every thing which could gratify and improve his exact and refined taste, for all that is great and beautiful: and how advantageously to himself, as well as usefully to the public, he employed himself there, his works bear ample testimony.

At Florence he had the curiosity to inquire for the *Tabula Isiaca*: but getting no information about it, he desired leave to search for it in a lumber room over the gallery, where he found this valuable piece of antiquity, buried in dust and rubbish. He did the same service to the Florentines upon this occasion, as Tully formerly did the Syracusans, when he discovered to them the tomb of Archimedes *. At Padua he took the degree of Doctor of Philosophy and Physic, in August 1695; and spent some time afterwards at Naples and Rome. On his return home in 1696, he settled in the place of his birth; where he practised physic for some years, with a success and superiority of skill, which established his reputation, and laid the foundation of his future greatness.

In 1702, he published *A Mechanical Account of Poisons*; which work was so well received, that an abstract of it was inserted in the Philosophical Transactions † for January and February 1703. It was

* Tusc. Quæst. v. 3.

† N^o 283.

reprinted in 1708, with some additions; but as it stands in this collection, it is taken from the edition of 1747, which differed so much from any of the former, that it might almost be looked upon as a new performance. In his younger days he imagined, that he was able to account mechanically for the effects of several poisons, by their mixture with the blood; but he was afterwards convinced, that there is in all living creatures a vehicle infinitely more subtle, an ethereal and invisible liquor, over which poisons have a real, though inexplicable power *. This retracting of an opinion, early espoused, and which procured him great credit in the literary world, shews a candour and ingenuity becoming a great man.

In 1704, appeared his treatise *De imperio solis ac luna in corpora humana, et morbis inde oriundis*. His reasonings upon this abstruse subject are grounded upon the principles of planetary attraction, lately discovered by Sir Isaac Newton; and, as the system of that illustrious philosopher was then but little known, so it is easy to conceive, that our author's performance would be rather admired, than understood, by the generality of readers. He republished it in 1748, with alterations and additions.

Dr Mead, in his travels through Italy, met with Bonomo's letter to Redi, setting forth his discoveries with relation to the cutaneous worms that generate the itch. He presented an analysis of it to the Royal Society; which, together with his Account of Poisons, deservedly procured him a place in that very useful body. This analysis was inserted in the Philosophical Transactions † of the first months of the year 1703.

* See the preface.

† Artic. 2.

This same year he was chosen physician to St Thomas's hospital; and about the same time was appointed, by the surgeons company, to read the anatomical lectures in their hall.

In 1707, his Paduan diploma for Doctor of Physic was confirmed by the university of Oxford. In 1716, he was admitted fellow of the college of physicians; and went through all the offices of that learned body, except the presidentship, which he declined in the year 1744. Though nothing could be greater than our physician's merit, yet it might not have been thus universally known so soon, if it had not been for the famous Dr Ratcliffe. Ratcliffe took a particular pleasure in patronising a young man of Mead's excellent and amiable endowments; and in 1714, when the former died, the latter succeeded him in his house, and in the greater part of his business. He had quitted Stepney some years before this, and had resided in Crutched, and then in Austin Friars, for the sake of being near St Thomas's hospital. The distance of his new habitation from thence, for Ratcliffe lived in Bloomsbury-Square, induced him to resign his place of physician; upon which occasion he received the unanimous thanks of the grand committee for his services, and was presented with a governour's staff.

Dr Mead was now at the head of his order, as we learn from the testimony of writers, who cannot be supposed to have flattered. The celebrated Dr Jurin addressed to him *A dissertation concerning the force of the heart*, written against what the no less celebrated Dr James Keill had advanced upon that subject: and he begins it in the following remarkable manner.

“ Sir,

“ Sir, Though I am not ignorant how rude and imperfect this dissertation is, yet I readily venture to submit it to your penetrating judgment. For how could I wish for a more impartial judge, or how could I chuse a more proper umpire, than him, whose remarkable candour and humanity are as well known to us all, as those excellent talents which he enjoys, adorned with every kind of learning; and by whose bright genius and fine judgment we see the theory of medicine enlightened and illustrated, and the practice of it strengthened and made easy? Nor is there any one living, of whose approbation I should be more desirous, or under whose authority this discourse, if it has the good fortune not to displease you, will be more safe from the cavils of some perverse people *.” Dr Keill also addressed his answer to the foregoing dissertation, to Dr Mead: “ For,” says he to him, “ as my adversary has besought you to be his patron, so I desire to leave this controversy to your determination, who are a fit and learned judge of it. And for your part, great Sir, who hold the first rank in physic, be pleased so to moderate by your prudence the disputations of those who differ in opinion, that they may not be contemptible to the unlearned, but profitable to the learned †.” These papers were written at first in Latin, printed in the Philosophical Transactions, and dated, the former January, the latter June, 1719: from which it appears, that Dr Mead was applied to by the ablest men, as a fit moderator and judge in the most difficult questions, although he was not much

* Keill's essays on several parts of the animal economy, p. 54. Lond. 1738.

† Ibid. p. 79. 84.

beyond that period of life when the generality of his profession begin to emerge.

It is remarkable, that party-principles never influenced this great man's attachments: and though he was himself a very hearty Whig, yet he was upon terms of the strictest intimacy with Garth, Arbuthnot, and Freind. And when the last, upon a suspicion of being concerned against the government with Bishop Atterbury, was committed a prisoner to the Tower in 1723, Dr Mead constantly visited him, and became one of his sureties to procure his enlargement. But what contributed to cement the friendship between Freind and Mead, was a common quarrel they had been engaged in some years before. Dr Mead having had frequent opportunities of experiencing the efficacy of purgatives to prevent, or at least to lessen, the secondary fever, which so often proves fatal in the confluent small-pox, communicated this method of practice to several of his brethren, particularly to Ratcliffe and Freind. Freind adopted it; and in his commentary on the first and third books of Hippocrates's epidemics, published in 1717, inserted the letter which Mead had written to him upon that subject some years before. These two gentlemen being now considered as associates in the same cause, a party was immediately formed against the new practice and its favourers; at the head of which was Dr John Woodward, physic-professor at Gresham college, who published, upon this occasion, *The state of physic and diseases, with an inquiry into the causes of the late increase of them, but more particularly of the small-pox.* In this performance Dr Woodward was not content with condemning the practice, but treated its
favourers

favourers with contempt and ill manners, and more particularly our author; whose resentment, though just and well grounded, appears nevertheless to have been carried to a very exceptionable length, seeing it had not subsided twenty years after the death of his antagonist*.

In 1719, when the plague was so fatal at Mar-seilles, the Lords of the Regency directed Mr Secretary Craggs to apply to Dr Mead, as a man the best qualified to find out the most effectual methods to prevent its spreading. This occasioned the publication of his *Short discourse concerning pestilential contagion, and the methods to be used to prevent it*, in 1720; which was so greedily received, that no less than seven editions were printed in one year. The eighth, which appeared in 1723, was enlarged with many new observations, and a whole chapter on the method of cure; and the last, in 1744, was not without improvements.

In 1723, Dr Mead pronounced the *oratio Har-veiana* before the college of physicians, which was published in 1724; and to it was annexed, *Dissertatio de nummis quibusdam a Smyrnaeis in medicorum honorem percussis*. This oration was attacked with some smartness by the most ingenious and learned Dr Conyers Middleton, in a piece, entitled, *De medicorum apud veteres Romanos degentium conditione dissertatio, in qua, contra viros celeberrimos Jacobum Sponium et Richardum Meadium, servilem atque ignobilem eam fuisse ostenditur*†. Mead's side of the question was defended by Dr John Ward, late professor of rhetoric

* Preface to his treatise on the small-pox and measles.

† Middleton's works, vol. iv.

in Gresham college; whom Dr Middleton, in a reply, treated with much contempt. Nevertheless, he every where expresses the greatest regard for Dr Mead; and, in a work published several years after, mentions him in the most honourable manner. He is speaking of an antique picture, which he supposes to be the first, and the only one of the sort ever brought to England; *donec Meadius noster, says he, artis medicæ decus, qui vitæ revera nobilis, vel principibus in republica viris, exemplum præbet, pro eo, quo omnibus fere præstat, artium veterum amore, alias postea quasdam & splendidiore, opinor, Roma quoque deportandas curavit**.

In 1727, soon after his late Majesty's accession to the throne, he was appointed one of the royal physicians; and for many years was engaged in the constant hurry of an extensive and successful practice. When, through age, he was grown unequal to the discharge of more active functions, and retirement was become absolutely necessary, he took the opportunity to revise his former writings. Some have already been mentioned, which were republished in this season of his life; and in 1747, came out his discourse, *De variolis & morbillis*, to which was annexed a treatise on the same diseases, by the celebrated Arabian physician Abubeker Rhazes, faithfully translated from the original Arabic into Latin. A copy of the only remaining Arabic manuscript of Rhazes's treatise was communicated from Leyden by the celebrated Boerhaave; between whom and our author there always subsisted a very friendly correspondence. In his discourse upon the small-pox, there is a chapter

* *Germana quædam antiquitatis eruditæ monumenta, p. 2. Works, vol. iv.*

upon inoculation; from which it appears, that he was greatly concerned in introducing and establishing this laudable practice among us.

The year 1749 furnished out two new productions from our author; namely, *Media sacra, sive de morbis insignioribus qui in Bibliis memorantur commentarius*; and, *A discourse on the scurvy*, annexed to Mr Sutton's second edition of his method for extracting the foul air out of ships. The last, and, as some think, the most useful of all his works, is his *Monita et Præcepta medica*, published in 1751. Here, with great candour and simplicity, he communicates all the discoveries that long practice and experience had opened to him, concerning diseases and their cures; and concludes with many salutary directions for preserving the body and mind, perfect and entire, to a good old age. Though his faculties do not seem to have been at all impaired in this last work, yet he did not find himself in a condition to finish any thing further; but gently decaying, and growing weaker every day, he expired upon the 16th of February 1754, without visible signs of pain, and was buried on the 23d in the Temple church, near his brother Mr Samuel Mead, an eminent counsellor at law, who died twenty years before.

Dr Mead was twice married. By his first wife, Ruth, the daughter of Mr John Marsh, merchant of London, whom he married in 1699, and who died in 1719, he had eight children; four of whom died in their infancy. Of the rest, the second daughter, now deceased, was married to the late Charles Bertie, of Uffington in Lincolnshire, Esq; the eldest to Dr (now Sir) Edward Wilmot, and the youngest to Dr

Francis Nichols, both physicians in ordinary to his Majesty. His only son, Richard Mead, is married to Anne, the daughter of William Gore, Esq; of Tring in Hertfordshire. The Doctor's second wife, who is still living, was Anne, daughter of Sir Rowland Alston, Bart. of Odell in Bedfordshire, whom he married in August 1724, but had no issue by her.

To attempt a formal elege of this great man, would be impertinent in a preface to his works; and especially after what has been occasionally dropped in the course of these memoirs. There is however one circumstance relating to him which deserves to be mentioned, because it is uncommon; which is, that, by his singular humanity and goodness, he conquered even envy itself: and accordingly this compliment was justly paid him in a dedication, by the editor of Lord Bacon's works, in the year 1730.

It would be impertinent in like manner, because it would be tedious, to enumerate the great and various services he did to the republic of letters. Let it suffice to observe, what indeed every body knows, that few princes have shewn themselves equally generous and liberal, in promoting science, and encouraging learned men: and this is the true reason why Dr Mead, notwithstanding the immense gains arising from his profession, did not die so rich as might have been expected.

As to his literary collections and other curiosities, the world has already been acquainted with their value and contents by printed catalogues; and it may perhaps be said, not unjustly, that no subject in Europe had a library and a cabinet so richly and so judiciously furnished. Nor did he make this great collection

lection merely for his own use, but freely opened it to others ; so that ingenious men were sure of finding at Dr Mead's the very best helps in all their undertakings.

He maintained a constant correspondence with all the literati in Europe ; and his reputation as a scholar, as well as a physician, was universally established. There cannot be a better proof of this, than the King of Naples sending him the two first volumes of Signior Bajardi's of the antiquities found in Herculaneum ; with the additional compliment of asking in return, only, a complete collection of his own works. This prince at the same time invited him to his palace, that he might have an opportunity of shewing him all those valuable monuments of antiquity ; and Dr Mead used to declare to his friends, that his years alone restrained him from undertaking a journey so suited to his taste and inclination.

Upon the whole, no foreigner of any learning, taste, or even curiosity, ever came to England, without being introduced to Dr Mead, as it would have been a matter of reproach to have returned without seeing him. On these occasions, his table was always open ; where, what seldom happens, was united the magnificence of princes with the pleasures of philosophers.

To conclude : He was sincerely the friend of all ingenious and learned men, at home and abroad ; of Pope, of Halley, of Newton, with whose portraits his house was furnished. He presented to the college of physicians a marble busto of Harvey, done by an excellent hand, from an original picture in his possession ; to which his own has been added by Dr Askew, done by Roubilliac, and placed near Dr Harvey.

16 MEMOIRS of the AUTHOR's LIFE.

His son has likewise caused a handsome monument to be erected to his memory in Westminster-abbey, with the following inscription by Dr Ward, of Gresham-college.

M. S.

V. A. RICHARDI MEAD ARCHIATRI
 ANTIQVA APVD BVCKINGENSES FAMILIA NATI
 QVI FAMAM HAVD VVLGAREM MEDICINAM FACIENDO
 IN PRIMA IVENTVTE ADEPTVS
 TANTA NOMINIS CELEBRITATE POSTEA INCLARVIT
 VT MEDICORVM HVIVS SAECVLI PRINCEPS HABERETVR
 IN AEGRIS CVRANDIS LENIS ERAT AC MISERICORS
 ET AD PAVPERES GRATVITO IUVANDOS SEMPER PARATVS
 INTER ASSIDVAS AVTEM ARTIS SALVTARIS OCCVPATIONES
 OPERIBVS NON PAVCIS DOCTE ET ELEGANTER CONSCRIPTIS
 QVAE INGENIO PERSPICACI ET VSV DIVTVRNO NOTAVERAT
 IN GENERIS HVMANI COMMODYM VVLGAVIT
 LITERARVM QVOQVE ET LITERATORVM PATRONVS SINGV-
 LARIS
 BIBLIOTHECAM LECTISSIMAM OPTIMIS ET RARISSIMIS LI-
 BRIS
 VETERVMQVE ARTIVM MONVMENTIS REFERTAM COMPA-
 RAVIT
 VBI ERVDITORVM COLLOQVIIS LABORES LEVABAT DIVRNO
 ANIMO ITAQVE EXCELSO PRAEDITVS ET MORIBVS HVMANIS
 ORBISQVE LITERATI LAVDIBVS VNDIQVE CVMVLATVS
 MAGNO SPLENDORE ET DIGNITATE VITA PERACTA
 ANNORVM TANDEM AC FAMAE SATVR PLACIDE OBIIT
 XIII KALENDAS MARTIAS A. D. MDCCLIV AETATIS SVAE
 LXXXI
 ARTIVM HVMANIORVM DAMNO HAVD FACILE REPARABILI
 QVIBVS IPSE TANTVM FVERAT DECVS ET PRAESIDIVM
 BIS MATRIMONIO IUNCTVS
 EX PRIORI DECEM SVSCEPIT LIBEROS
 QVORVM TRES TANTVM SVPERSTITES SIBI RELIQVIT
 DVAS FILIAS VIRIS ARCHIATRORVM HONORE ORNATIS NVPTAS
 ET VNVM SVI IPSIVS NOMINIS FILIVM
 QVI PIETATIS CAUSA PATRI OPTIME DE SE MERITO
 MONVMENTVM HOC PCNI CVRAVIT

CON-

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T H E
W O R K S
O F

Dr RICHARD MEAD.

A Mechanical ACCOUNT of POISONS.

In several E s s a y s.

A D V E R T I S E M E N T.

THis book was first published in the year 1702, and reprinted, with very few additions, in 1708. I then really intended never more to trouble myself about it: but the demand for it having for many years been so great, as to tempt some booksellers to print it twice or thrice, very incorrectly, in a piratical way (as they call it), without my knowledge; I have thought it right, both in justice to the public and myself, to give a new edition of it.

It will easily be believed, that after more than forty years (spent neither without study nor experience) I cannot be fond of a little performance in physick, written at a time of life, in which the facts must, for the most part, be taken from other authors, and the reasonings

reasonings upon them would often require more patient thinking, and a riper judgment. And therefore I make no doubt but the public always made great allowances upon this account, when they gave the book so favourable a reception.

In return to this kind usage, I have now taken some pains to reconsider my subject. Besides many other improvements, I have often from my theory drawn observations, useful, as I imagine, in practice. Neither have I been ashamed, on some occasions, (as the Latins said), *cadere vineta mea*, to retrench or alter whatever I have judged to be wrong. *Dies diem docet*. I think truth never comes so well recommended, as from one who owns his error: and it is allowed that our first master, Hippocrates, never shewed more wisdom and greatness of mind, than in confessing his mistake, in taking a fracture of the scull for the natural future *; and the compliment which Celsus † makes to him on this occasion, is very remarkable and just: *More scilicet, inquit, magnorum virorum, et fiduciam magnarum rerum habentium. Nam levia ingenia, quia nihil habent, nihil sibi detrahunt: magno ingenio, multaue nihilominus habituro, convenit etiam simplex veri erroris confessio; precipueque in eo ministerio, quod utilitatis causa posteris traditur.*

I might however urge in my excuse, that as the notions I have retracted, regard chiefly the nervous fluid, and its properties; so my new reasonings are founded upon experiments of electricity and attraction, applied to this fluid, which at the time of my writing were not known. The instructive queries

* Epidem. lib. 5. § 14.

† Medicin. lib. 8. c. 4.

and

and suppositions of Sir Isaac Newton, and the surprising electrical operations of Mr Stephen Gray *, improved by Monsieur du Fay at Paris †, had not then enlightened the learned world.

But there are here two additions, which I ought particularly to mention: the first is the introduction. Having observed, that the action of poisons, though they are of very different kinds, is generally uniform; and also, that the animal spirits are first affected by it; I have thought it proper, as this opinion may seem somewhat strange and singular, to premise an inquiry into the nature of the nervous fluid, of which it must be owned that we know too little. And if, in a matter so abstruse and difficult, what I have advanced has more in it of conjecture than of demonstration, it may be allowed to be something.

Quadam prodire tenus, si non datur ultra †.

Whoever will pass a judgment upon such nice speculations, must take the whole scheme together. Truth is always a connected scheme; and inferences justly drawn not only illustrate, but confirm one another.

The other addition is, “An anatomical description of those parts in a viper, and in a rattle-snake, which are concerned in their poison,” by our great anatomist the learned and ingenious Dr Nicholls. He having taken notice, that the anatomical observations on the viper, by Dr Areskine, in the first edition, were neither complete, nor in every point true, has been pleased to give a new anatomy of the whole head, not only of the common viper, but also of that

* Vid. Phil. Transf. † Vid. Memoires de l'Academie,
1733, 1734, 1737. † Horat. Epist. 1. v. 32.

larger kind of it, the rattle-snake : that so those parts which cannot so easily be seen in the smaller, may more distinctly appear in the bigger animal. How accurately he has performed this task, and how thoroughly he has explained the mechanism and offices of the several organs, any one may judge, who will compare his descriptions with the best of those which have been hitherto made by other anatomists.

THE PREFACE TO THE FIRST EDITION.

TO give an exact and particular account of the nature and manner of the action of poison, is no easy matter ; but to discourse more intelligibly of them, than authors have hitherto done, not very difficult. One may without much pains shew their effects to be owing to something more than the bare qualities of heat or cold ; and discover the footsteps of mechanism in those surprising phænomena, which are commonly ascribed to some occult or unknown principle. But to unravel the springs of the several motions upon which such appearances depend, and trace up all the symptoms to their first causes, requires some art as well as labour ; and that both upon the account of the exquisite fineness and marvellous composition of the animal machine in which they are transacted, and of the minuteness of those bodies which have the force to induce in it such sudden and violent alterations.

I have attempted somewhat this way in the following essays ; in which I do not promise methodical and finished treatises, but only some short hints of natural

tural history, and rude strokes of reasoning ; which, if put together and rightly improved, may perhaps serve to furnish out a more tolerable specimen of the doctrine of poisons, than has yet been published.

The first draught of this small piece I made some years since, entertaining myself at leisure-hours with experiments on vipers, and other venomous creatures ; examining now and then the texture of arsenic, mercury sublimate, and the like malignant substances ; turning over what authors had said on the several subjects, and making such remarks as from time to time occurred.

These continued inquiries made up at last three or four short discourses ; which when I began to digest into order, the increase of business contracted the intervals of my spare time ; and the diversion of such studies quickly giving way to the severity of more necessary labours, they were quite thrown by. Till talking not long since with Dr Areskine concerning the viper, I took occasion to review my scattered papers, and confirm my reasonings by new experiments. He very readily offered me his anatomical observations. These I have put at the end of the first essay : which do not promise a complete dissection of the animal, but chiefly shew the make of those parts which are concerned in the poison.

My design, in thinking of these matters, was, to try how far I could carry mechanical considerations in accounting for those surprising changes which poisons make in an animal body ; concluding (as I think, fairly) that if so abstruse phænomena as these come under the known laws of motion, it might very well be taken for granted, that the more obvious
appearances

appearances in the same fabric are owing to such causes as are within the reach of geometrical reasoning: and that therefore as the first step towards the removal of a disease is to know its origin; so he is likely to be the best physician, who, having the same assistance of observations and histories with others, best understands the human œconomy, the texture of the parts, motions of the fluids, and the power which other bodies have to make alterations in any of these.

Nor indeed ought any one to doubt of this, who considers that the animal compages is not an irregular mass, and disorderly jumble of atoms, but the contrivance of infinite wisdom, and the masterpiece of that creating power, who has been pleased to do all things by established laws and rules, and that harmony and proportion should be the beauty of all his works.

It were therefore heartily to be wished, that those gentlemen who are so much afraid of introducing mathematical studies, that is, demonstration and truth, into the practice of physic, were so far at least instructed in the necessary disciplines, as to be able to pass a true judgment, what progress and advances may be made this way. They would not then perhaps decry an attempt of so much moment to the welfare of mankind, as vain and impossible; because it is difficult, and requires application and pains.

It is very evident, that all other methods of improving medicine have been found ineffectual, by the stand it was at for above two thousand years: and that since of late mathematicians have set themselves to the study of it, men already begin to talk so intelligibly

ligibly and comprehensibly, even about abstruse matters, that it may be hoped in a short time, if those who are designed for this profession, are early, while their minds and bodies are patient of labour and toil, initiated in the knowledge of numbers and geometry, that mathematical learning will be the distinguishing mark of a physician from a quack; and that he who wants this necessary qualification, will be as ridiculous as one without Greek or Latin.

I have, as to what regards the animal œconomy, referred as much as I could to the works of Bellini, which have brought great light into the dark regions of physic, and taught us to argue clearly and consistently, instead of amusing ourselves with unintelligible words or precarious hypotheses. The dissertations of Dr Pitcairne, the honour of his profession in Scotland, are a convincing proof of the advantage of such a mechanical way of reasoning: nor could Malice itself deny this, were not Ignorance in confederacy with it, which will secure any one from being benefited by the most useful demonstrations.

Notwithstanding this, I have been forced now and then to make digressions from my subject, to clear some doctrines necessary to be known, which have not been explained by others. For indeed the data from which we argue in these matters, are by many too few. Dr Cheyne, the author of the new theory of fevers, has enumerated several particulars, in which the theoretic part of medicine still wants improvement. If these deficiencies were made good, we might with more ease proceed in our inquiries into human nature; and should soon convince the world, that the

most useful of arts, if duly cultivated, is more than mere conjecture, or base empiricism.

As to the authors I have made use of, who have treated of poisons, I have quoted only those who furnished me with matter of fact : for there are but few originals ; and very large volumes on this subject many times contain little more than a collection of vulgar errors.

I had once thought to have carried these searches farther ; in particular, besides what is occasionally mentioned in the last essay concerning infection in acute diseases, to have inquired into the nature of contagious and hereditary distempers. But the humour of scribbling would not hold out : and some perhaps will say, it is well enough it did not : for I am not ignorant, how few I am like to please. If it be hard to think and write justly, it is harder yet to bring others to one's own taste ; nor shall I be at all angry if to many I have afforded matter of satire and invective ; less wit suffices for these, than for the discovery of useful truths. They who have no smattering of mathematical knowledge, are incompetent judges of what service I have done towards the improvement of the theory, or practice of medicine ; and those who are acquainted with these matters, will, it may be, think it something to talk intelligibly on such difficult and abstruse points. I neither want applause, nor fear censure : and therefore be the fate of these papers what it will, as they were first penned for my own satisfaction, and innocent entertainment ; so I am resolved they shall never engage me in the trouble of quarrels or disputes.

London, 1702.

C O N-

C O N T E N T S.

I N T R O D U C T I O N.

E S S A Y I.

Of the viper.

An Appendix, containing anatomical observations on the viper and rattle-snake, and an account of some other venomous animals.

E S S A Y II.

Of the Tarantula.

E S S A Y III.

Of the mad dog.

E S S A Y IV.

Of poisonous minerals, and plants.

E S S A Y V.

Of Opium.

An Appendix, of laurel-water.

E S S A Y VI.

Of venomous exhalations from the earth, poisonous airs and waters.

INTRODUCTION.

Those things which are experienced to be in their whole nature, or in their most remarkable properties, so contrary to the animal life, as in a small quantity to prove destructive to it, are called poisons; whether they are hurtful by being taken inwardly at the mouth, or communicated to the body externally by a wound.

This subject has afforded matter for great disputes among philosophers, in their inquiries into the frame of the world. Some have made it an objection to the goodness of the Creator, that there should be any such productions as poisons in nature: on the other hand, Paracelsus, Van Helmont, and their followers, fond of magnifying their chemical art, tell us, that poisons are really designed for other purposes than is commonly thought; they being indeed great medicines, when their concealed useful qualities are, by our study and labour, discovered and brought out of them*. To prove this, they allege that remarkable saying of the wise man†: “God made not death, neither hath he pleasure in the destruction of the living. For he created all things, that they might have their being; and the generations of the world were healthful: and there is no poison of destruction in them, nor the kingdom of death upon the earth.”

As the knowledge of those minute philosophers, who find faults in the disposition of the universe, is generally too superficial; so I doubt the reasoning a-

* Vid. J. B. Van Helmont opera, pag. 373. † Wisdom of Solomon, chap. 1. ver. 13.

gainst them of our adepts, whose sight is often dazzled by the light of their furnaces, will, in the present affair, appear too deep and far-fetched. For it does not look like universal beneficence, to create substances, whose manifest and obvious qualities are noxious and destructive, though they may have other virtues which are salutary, but which are only to be extricated from them by deep searches of art, and the torture of the fire.

The true state of the case seems to be this. The productions of nature of this kind, as to us, are often medicinal, either in the external or internal use of them; and experience, improved by reasoning, teaches us to prepare and apply them to various purposes: but they are also not only physic, but even food to some other animals, which, by natural instinct, devour them; and these themselves afford not only good nourishment, but sometimes remedies to us. Little insects, which we think troublesome, are necessary to the life of wholesome birds and other creatures. Goats and quails are fattened by hellebore *, starlings by hemlock †, and hogs innocently eat henbane ‡; all which we call poisonous. Many instances might be given of the like kind. Will any one say that the venom of the viper is not made for our good, when without it (as will be observed in the following discourse) this reptile could not have been provided with those noble qualities, which render it effectual against some very stubborn diseases?

But this question may perhaps seem more difficult with regard to poisonous minerals: as, for instance,

* Lucret. lib. 4. 645.

† Galen. Simpl. Medic.

Fac. lib. 3. c. 18.

‡ Sext. Empiric. Hypoth. Emp. 1.

arsenic, which we find to be diffused almost through the whole mineral kingdom. Now, it must be observed, that this is not a perfect mineral, but an active substance made use of by nature in preparing several metals in the earth, which are of great service to mankind. It particularly appears to be so in the growth of silver, copper, tin, and lead; the ores of all which contain, besides common sulphur, a great deal of arsenic: so that this, in the language of the chemists, may be called a mineralising principle. And the case will be found to be much the same in all natural productions of this kind.

In short, there is in the fabric of the world a great chain and dependency of things upon one another: and though our knowledge does not reach to every particular link of it, yet the farther we advance in the study of nature, the more we shall find that

Whatever is, is right*.

But how much more would it appear to be so, could we look into the whole system of the universe, and see the relation which our world perhaps bears to some of those innumerable others in the immense space, which the almighty Being may probably have made dependent upon one another by established laws and order!

As to the text cited out of Solomon, the meaning of it is plainly this. “ God created nothing to be
“ destructive to mankind, but gave to all things their
“ proper nature; and the productions of the world
“ are wholesome. Even poisons were not designed
“ to be hurtful, but for good uses: for in all

* Pope's Essay on man, epist. 1.

“ the

“ the earth there are provisions made against death.”

Before we proceed to particulars, it may not be improper to give a general idea of poisons, to explain in what manner they act, and by what alterations made in our bodies they become so hurtful.

Now, as to this, it will appear from the following discourses, that though poisons are of different kinds, as well those which kill by wounds, as those which are taken inwardly ; yet there is a great agreement in the manner of producing their effects ; and that even internal poisons exert their force in a manner analogous to the external.

Venomous animals, when they bite or sting, inflict a wound, and instill into it a drop or more of liquor, which infects the fluid of the nerves, and by this means inflames the membranes : hereupon a swelling arises, sometimes to a degree of mortification, which spreads to the neighbouring parts.

Poisonous substances, being swallowed, wound the nervous coat of the stomach. An inflammation ensues, which, according as the poison is of a greater or lesser power, is communicated to the contiguous coats ; and in some cases, especially if it be of a mineral nature, ends in a perfect gangrene. For the difference between mineral and vegetable poisons lies chiefly in this, that the former are of greater force than the latter.

But in all accidents of this kind, whether the wound be outward or inward, the mischief does not stop at the part affected, but it is carried farther, even through the whole body.

This is done by the great activity of the nervous fluid, one part of which being infected immediately taints

taints all the rest : and thus the whole system of nervous expansions is drawn into spasms and convulsions ; which, according to the different offices of the parts to which the nerves belong, produce different symptoms. In the stomach and intestines, these spasms cause sickness, vomitings, and gripes ; in the brain, deliria, sleepiness, and epileptic fits ; in the heart, intermissions of the arterial pulse, palpitations, and swoonings ; in the lungs, difficulty of breathing, with strangling and suffocations ; in the liver, by the spasmodic contraction of the biliary ducts, the bile is returned into the blood, and makes a jaundice ; in the kidneys, the same disposition of the urinary canals interrupts the secretion of urine, and makes it quite irregular. In short, the animal œconomy is all disturbed : and though different poisons may shew their most remarkable effects in different parts, and these, according to the violence of the hurt, may appear in very different degrees ; yet the symptoms always make it plain, that the first bad impression is made upon the animal spirits.

I have in another place shewn, from the manner in which persons are seized in pestilential fevers, that is, with faintness, giddiness, palpitations of the heart, tremblings, &c. that the nervous fluid is likewise principally affected in these diseases ; contagion being indeed a real poison *.

It will therefore be proper to inquire into the nature of this liquor : for I think no regard ought to be had to the immechanical notions of those authors who imagine that there is no such thing in an animal body ; and that muscular motion and sensation are

* Vid. Discourse on the plague.

performed only by the vibrations of the fibres of the nerves, without the intervention of any spirituous fluid.

They who can satisfy themselves with such a scheme, seem to have very little attended to what is transacted within us, in the effects of sudden passions of the mind ; in the instantaneous translations of diseases from one part to another, as particularly in the gouty humour ; and in the surprising changes made, sometimes in a moment, in the secretions of those liquors upon which life depends.

But, to say no more, as the brain is manifestly a large gland, with a most exquisite apparatus for the separation of a liquor from the blood ; this must, like all other glands, have an excretory duct : now, the nerves are evidently contrived for this purpose, and consequently must always contain a proper subtile juice.

To proceed therefore ; this fluid, so far as we can discover by its effects, is a thin volatile liquor, of great force and elasticity ; being indeed most probably a quantity of the universal elastic matter, incorporated with fine parts of the blood, separated in the brain, and lodged in the fibres of the nerves. This is the instrument of muscular motion and sensation, a great agent in secretions, and indeed in the whole business of the animal œconomy.

By the universal elastic matter I understand that subtile and active substance, diffused throughout the universe, which our great philosopher, Sir Isaac Newton, supposes to be the cause of the refraction and reflection of the rays of light, and by the vibrations of which light communicates heat to bodies ; and
which

which readily pervading all bodies, produces many of their actions upon one another.

I refer, for the sentiments of this divine man, to his Optics *; but more especially to a most remarkable letter of his to the Honourable Mr Boyle, written many years since †. Whoever thoroughly comprehends and considers what is delivered in these pieces, under the form of queries and suppositions, will be let into some knowledge of the secret springs of nature; and will then, I hope, be inclined to think, that I have not been wrong in endeavouring to introduce the same principles from the inanimate into the animated world.

It seems very reasonable, from that uniformity which there is in the laws of nature, to conclude that the animal spirits are something of this kind; for there can be no greater presumption in favour of a scheme, than that it is simple, and of a piece with the known system of the universe.

Now, an active substance of this kind in the nerves, must necessarily be very susceptible of alterations from other bodies of extreme minuteness and great force: in like manner as we see some chemical liquors, upon their first approach to each other, to fall into fermentations; the result of which is a compound mixture of a quite different nature, from what might have been expected from the single ingredients.

Thus the compound spirit of nitre put to oil of cloves will effervesce even to a flame; a fermentation

* Qu. 23. 24. † Published in the life of Mr Boyle, prefixed to his works, p. 70. which life is since printed by itself.

being indeed no more than the attraction and repulsion of the particles of different bodies, when they come together.

By reflecting upon the phænomena which the experiments of late years made upon electricity* have discovered to the world, and viewing the attractions and repulsions of the finest particles of electrical substances, any one may easily form an idea of this animal fluid, and of the excessive force and velocity with which it acts.

It is very observable, that the communication of electricity is much greater through animal than through inanimate bodies: that is, the elastic fluid passing through these meets with a greater quantity of the same matter in them than in the other; the solid animal fibres being more adapted to receive it. The experiment of the boy suspended on silk or hair lines† is equally surprising and instructive, demonstrating this elastic spirit, even to our sight and touch. And if the nerves, as Sir Isaac Newton supposes, are very small, but solid, pellucid and uniform capillamenta, wrapt up in bundles; the glass tube rubbed by the hand, and its action with the elastic fluid, represent to us in some degree the nerves and the animal spirits lodged in them.

Perhaps the prosecution of such trials upon living creatures, may in time make us more acquainted with the laws and actions of this impetuous part (as Hippocrates ‡ calls it) in the animal machine.

* Philos. Transact. N^o 366. 417. 422. 423. 426. 436. 439. 444. † Ibid. N^o 417. ‡ Epidem. lib. vi. § 8.
Τὰ ζῷωντα σάματα.

Ita res accendunt lumina rebus.*

It is sufficient to our present purpose, to have described the nervous fluid so far, as to shew it to be such a one as is endowed with great activity and force, and therefore capable of receiving various alterations from other bodies, especially such as consist likewise of very subtile and powerful particles: and all poisons, we know, are of this kind.

I was of opinion, when I first wrote these essays, that the effects of poisons, especially those from venomous animals, might be accounted for by their affecting the blood only: but the consideration of the suddenness of their mischief, too quick to be brought about in the course of the circulation, (for the bite of a rattle-snake killed a dog in less than a quarter of a minute †), together with the nature of the symptoms entirely nervous, induced me to change my sentiments. For if, as Dr Keill has computed ‡, the velocity of the blood is more than five thousand times lesser at the fortieth branch from the great artery, than it is in this artery before any ramification is made from it; how is it possible, that the brain, heart, &c. should feel so sudden a hurt, unless it were conveyed to them by a medium of much greater quickness? and this can be no other than the animal spirits.

Neither is it amiss to add, that the observations I have made, if improved, may also afford hints useful in the cure of many diseases. For, though some of those distempers which we call nervous, as particu-

* Lucret. lib. i. ver. 1110. † Philosoph. Transact.
No 399. ‡ Vid. Tent. Medico-physic. 2.

larly paralytic weaknesses, may be accounted for by irregular motions and obstructions of the animal spirits only; yet many of them certainly must arise from ill affections of the spirituous fluid itself. It can, for instance, never be conceived that the surprising appearances in phrenitical, maniacal, and melancholy disorders, should be brought about without alterations, suitable to the different cases, made in that active liquor, by which the mind governs the body.

There are many other cases, judged extraordinary, and not easily to be explained, which depend almost solely on the animal spirits. I shall mention only one.

A surgeon of great merit and experience, in a very useful book, lately published *, has observed, that sometimes in gun-shot wounds, attended with a great laceration of the membranes, though things seem to go on well for some days; yet the patient is suddenly seized with convulsions in his face, which so fix the jaws that he cannot speak, though the senses are not impaired, and inevitably dies. It is, I think, very plain, that this dreadful symptom must be owing to the bad condition of the nervous liquor, which it is brought into by the tearing of the membranes, and which, notwithstanding the tolerable state of the blood, does, by its own disorder, produce fatal consequences.

And as we see, in the mentioned electrical experiments, how remarkably the subtile matter is altered in its motions and effects, even by the simple contact of other bodies; it must certainly be allowed, that when the same comes to be incorporated with the

* Ranby on gun-shot wounds, p. 72.

finest part of the blood, it will, according to the condition in which this is, make a fluid, elastic indeed, but at different times in a different degree, and therefore variously affected by external agents.

But to return to poisons : As the different state of the nervous fluid may in some measure alter their effects ; so likewise these themselves, though really of the same kind, may yet so differ in their force and degree of action, as to be hurtful in various and seemingly different ways.

Upon this consideration, the surprising stories related by authors, of the different deaths inflicted by serpents of different kinds, particularly in Africa, are not at all incredible. I very well remember, that the learned Paul Herman, many years ago professor of botany in the university of Leyden, who had lived a great while in India, affirmed, that there were also in several parts of that country venomous creatures, of the same kind with those described by the African historians, which killed by very different effects of their poison ; and that, upon due inquiry into facts, he was convinced that the beautiful descriptions in Lucan * of the various species of vipers which Cato met with in the hot Libyan deserts, were not poetical fictions, but taken from nature. He had in his museum, preserved in spirit of wine, several of these very serpents ; particularly the *Aspis*, called *Nintipolongha Zeylanica*, whose bite induced a deadly sleep ; the *Dipsas*, or *Situla Macassarica*, which killed with an unquenchable thirst ; and the *Hæmorrhous Macassaricus*, the poison of which was immediately followed by hæmorrhages from all the pores of the body.

* Lib. ix.

For we must observe likewise, that although the first impression of the poison be made upon the nervous spirit, yet the whole mass of blood very quickly partakes of the hurt: not, I suppose, from any mixture of the venom with it, but from such a corruption of it, as an irregular circulation, interrupted secretions, and stagnations in the smallest vessels, (the consequences of a vitiated nervous fluid), may naturally produce. Nor will this seem strange, since such a compounded liquor as the blood is, may certainly undergo any imaginable changes by alterations made in its motion only.

Thus much concerning the general action of poisons: the effects of the particular kinds of them, described in the following discourses, will (at least in my opinion) be so many proofs of the truth of the doctrine I have advanced.

E S S A Y I.

OF THE VIPER.

THE viper has always been so remarkable for its venom, that the most remote antiquity made it an emblem of what is hurtful and destructive. Nay so terrible was the nature of these creatures, that they were very commonly thought to be sent as executioners of divine vengeance upon mankind for enormous crimes, which had escaped the common course of justice. Thus Herodotus* and Ælian† do both take notice that adders were sacred

* Lib. ii. cap. 74.

† De animalib. lib. xvii. c. 5.

among those masters of learning and superstition, the Egyptians; that they affirmed of one sort of them particularly, that they were made to be ministers of the will of the gods, by averting evil from good men, and punishing the bad. Therefore the goddess Isis was represented with an asp upon her head *, to denote both her wisdom and power. And from her the Greeks and Romans honoured Minerva with the same symbol, as she often appears dressed in antique statues and gems. And Pausanias † observes of the Arabians, that they forbore to offer any violence to the vipers, which were found near the balsam-tree, as reputing them holy. The footsteps of which superstition still remain among these people to this very day: for Veslingius ‡ saw many of them take these creatures into their houses, feed them and worship them as the geni of the place. The same odd fancy obtains in the East Indies: for the king of Calicut causes cottages to be set up for serpents to keep them from the rain, and makes it death to any that shall hurt one of them; thinking them to be heavenly spirits, because they can so suddenly kill men ||. A remarkable instance of such an opinion as this we have in the history of St Paul †, whom the people of Malta, when they saw the viper leap upon his hand, presently concluded to be a murderer; and as readily made a god of him, when, instead of having his hand inflamed, or falling down dead, (one or other of which is usually the ef-

* *Aspide cincta comas*——Valer. Flacc. *Argonautic.* lib. iv. ver. 418. *Dextra lavæque fulcis insurgentium viperarum cohibita.* Apulcius *Metam.* lib. ii. p. m. 249. † Boetius p. m. 303. ‡ Not. in Alpin. de plant. *Ægypt.* cap. 14. || Purchas's *Pilgrimage*, book v. chap. 12. † Act. Apost. chap. xxviii.

fect of those bites), he without any harm shook the beast into the fire; it being obvious enough to imagine, that he must stand in a near relation at least to the gods themselves, who could thus command the messengers of their vengeance, and counterwork the effects of such powerful agents.

I have sometimes thought that this might be the reason, why antiquity not only represented the first masters of physic, Hermes, Æsculapius, Hippocrates, &c. in their statues and medals, with a viper added to their figure, but also worshipped them under this form: for diseases in those days, especially the most violent, plagues, fevers, &c. were in like manner, as these creatures, reputed the commissioned messengers of divine anger and displeasure*. They therefore who by their art could cure and stop the course of these, as they were supposed to do this by the particular leave and assistance of heaven, so had honours paid to them accordingly: and this representation was in the nature of an hieroglyphic character: for, as the learned Spanheim observes†, the viper was a symbol or emblem of divine power.

But to say the truth, that which the ancients made the symbol of health, does not seem to have been the viper, but the innocent snake or serpent of that kind, of which Lucan speaks‡:

Vos quoque qui cunctis innoxia numina teritis

Serpitis, aurato nitidi fulgore dracones.

* Cornel. Cels. præfat. in medicin. Morbos ait ad iram deorum immortalium relatos esse, et ab iisdem opem posci solitam. † Divinæ potentiae symbolum.

Vid. Ezech. Spanheim. de usu numismat. p. m. 125. 126. & 181. & seq. ‡ Pharsal. lib. ix. ver. 729.

And if so, the reason Macrobius gives for this custom may be a very good one; which is from the property all serpents have of casting their exuvia, or upper skin, every year, which makes them fit emblems or representations of health: the recovery whereof from sickness and diseases may justly be looked upon as the beginning of a fresh period of life, and (as the throwing off the senectus of these creatures seems to be) the renewing of age*.

Be that as it will, certain it is, that such fond and superstitious fancies concerning the viper, together with the mistaken opinion that few of its parts were exempt from poison, did not suffer the ancients to make any curious inquiries into its nature by anatomy and experiments. And this is the cause of the many errors they have delivered down to us in these points; which by gradual advances have since been rectified, and the inward make, properties, and generation of this animal, have been largely treated of; more especially M. Redi †, Charas ‡, and Dr Tyson in his dissection of the rattle-snake ||, which is a larger species of the viper, have taken pains on this subject; to whose discoveries what is yet wanting, we shall add at the end of this essay.

The symptoms which follow upon the bite of a viper, when it fastens either one or both its greater

* Ideo simulacris eorum [Æsculapii et Salutis] junguntur figuræ draconum, quia præstant ut humana corpora, velut infirmitatis pelle deposita, ad pristinum revirescant vigorem: ut virescunt dracones per annos singulos, pelle senectutis exuta. Saturnal. lib. 1. c. 20. † Osservazioni intorno alle vipere. ‡ Nouvelles expériences sur la vipere. || Philosophical Transactions, vol. 12. No 144.

teeth in any part of the body, are an acute pain in the place wounded, with a swelling at first red, but afterwards livid, which by degrees spreads farther to the neighbouring parts: with great faintness, and a quick, though low, and sometimes interrupted pulse, great sickness at the stomach, with bilious, convulsive vomitings, cold sweats, and sometimes pains about the navel; and if the cure be not speedy, death itself, unless the strength of nature proves sufficient to overcome these disorders: and though it does, the swelling still continues inflamed for some time; nay, in some cases more considerably upon the abating of the other symptoms, than at the beginning. And often from the small wound runs a fani-ous liquor, and little pustules are raised about it: the colour of the whole skin, in less than an hour, is changed yellow, as if the patient had the jaundice.

These mischiefs (although different climates, the season of the year more or less hot, the greater or lesser rage of the viper, the animal itself of a larger or smaller size, and consequently able to communicate more or less venom, the wound made deeper, in a part more nervous or tendinous, and therefore receiving more of the poisonous liquor, and the like circumstances, may variously heighten or abate them, yet) usually discover themselves much after the same manner in all: unless the bite happen not to be accompanied with the effusion of that liquor, which is the main instrument and cause of this violent and shocking disturbance.

But before I proceed to inquire into the nature and manner of the acting of this juice, it may not be improper to take notice, that the true use of it is to perform

perform an office of so great moment to the preservation of the individual, that without it this creature could not subsist.

For vipers live chiefly upon lizards, frogs, toads, mice, moles, and the like animals, which they do not chew, but swallow down whole; in which manner they lie in the stomach, or if that be not big enough to receive them, partly in that, and partly in the oesophagus, which is membranous and capable of great distension; till by the salival juices of those parts, together with the help of the fibres of the stomach, and the contraction of the muscles of the abdomen, they are gradually dissolved into a fluid substance, fit for the nourishment of their bodies, which is the work of many days. This is one reason why these creatures can live so long without taking any fresh food, which I have known them to do five or six months; as another is, that their blood is a grosser and more viscid fluid than that of most other animals: so that there is but a very little expense of it by transpiration, and consequently less need of recruit. This not only microscopes discover, but reason teaches: because there is but very little muscular force in the stomach to comminute the food, and make a chyle of fine parts; and therefore the blood must accordingly be of a tough and clammy consistence. Besides, the heart of a viper has properly but one ventricle, and the circulation of the blood is performed after the same manner as it is in a frog and tortoise, in which not above one third of it passes through the lungs: upon which account its comminution in them by the air is proportionally lesser than in other animals. Now, such a manner of feeding as
this

this does necessarily require, that the prey should upon the first catching be immediately killed: otherwise it were by no means fit to be let into the stomach. For we are not to think that the force of this part would be alone sufficient to destroy it, the subtilty of a living creature (besides the consideration of the weakness of the fibres) being in a great measure able to elude that; as indeed we every day find live animals in the ventricles of others: and therefore to do this is the proper use both of the teeth and their poison; for which being designed and adapted, it is no wonder if the viper, this same way by which it destroys its prey, proves sometimes mischievous to any other creatures besides, when it happens to be enraged, or by any provocation stirred up to bite.

The description of the poisonous fangs, their make, articulation, and motion, as also of the glands that separate the yellowish liquor, and the bags that contain it, I shall give, together with some anatomical observations, at the end of this discourse.

This venomous juice itself is of so inconsiderable a quantity, that it is no more than one good drop that does the execution. And for this reason authors have contented themselves with trials of the bite upon several animals, never essaying to examine the texture and make of the liquor itself: for which purpose I have oftentimes by holding a viper advantageously, and enraging it till it struck out its teeth, made it bite upon somewhat solid, so as to void its poison; which carefully putting upon a glass plate, I have with a microscope, as nicely as I could, viewed its parts and composition.

Upon the first sight I could discover nothing but

a parcel of small salts nimbly floating in the liquor; but in a very short time the appearance was changed, and these saline particles were now shot out as it were into crystals of an incredible tenuity and sharpness, with something like knots here and there, from which they seemed to proceed: so that the whole texture did in a manner represent a spider's web, though infinitely finer, and more minute; and yet withal so rigid were these pellucid spicula, or darts, that they remained unaltered upon my glass for several months *.

I have tried several ways to find out, if I could, under what tribe of salts these crystals are to be ranged, and to discover what alterations they make in the blood: and not without some difficulty, by reason of the minute quantity of the liquor, and the hazard of experiments of this kind, some curious friends, and myself together, made the following observations.

About half an ounce of human blood received into a warm glass, in which were five or six grains of the viperine poison newly ejected, was not visibly altered either in colour or consistence: it then was, and remained undistinguishable from the same blood, taken into another glass, in which was no poison at all.

These portions of blood were severally mixed with acids and alkali's: the empoisoned blood was, after such mixtures, of the same colour and consistence as the other.

Spirit of nitre, spirit of salt, and juice of lemons severally poured upon the sanies itself, produced neither fermentation, nor any change of colour.

* Vid. tab. r. fig. 10.

Salt

Salt of tartar run per deliquium, and the simple spirit of hartshorn, dropped upon the venom, neither altered its colour, nor raised any ebullition.

Syrup of violets mixed with the poison did not change its colour either to red or green.

The tincture of heliotropium, that is, blue paper, was not altered by the sanies ejected upon it: and this drying still retained its yellowish colour.

We caused several animals, dogs, cats, and pigeons to be bit by an enraged viper; which generally died, some in a longer, others in a shorter space of time. But we constantly observed, that they all immediately upon the bite shewed, with signs of acute pain, marks of their life being affected by sickness, faintings, convulsions, &c.

The head of a large viper lay three hours after it was cut off: it was perfectly flaccid and without motion. A pigeon wounded upon the breast with the fangs of his head, was presently convulsed, &c. as from the bite of the animal, and died in seven hours.

We contrived a sharp steel needle to be made, crooked, in shape not unlike to the viper's tooth, with a sulcus or hollow on the convex part, not far from the point: into this we put a drop of the venom, and with it wounded the nose of a young dog.

It produced the usual disorders of vomiting, purging, &c. but in a less degree, and the dog recovered. It was remarkable, that upon making the wound the dog cried but little, till the poison came into it: but then he howled, &c. in the same manner as if bit by the viper itself. But a pigeon pricked in the fleshy part of the breast by the same poisoned needle,

needle, suffered as from the bite, and died in about eight hours.

We made these last experiments, with a view to the controversy between Signor Redi in Italy, and Monsieur Charas in France. The former, from trials of the same kind with those we have now mentioned, affirmed that the venom of the viper lay in the yellow liquor of the gums. The latter, in opposition to this, espoused a notion advanced first by Van Helmont, and placed it altogether in the enraged spirits of the creature, calling this yellow liquor a pure innocent saliva; and alleged in proof of his assertion several experiments he made, with a success quite different from that with which Signor Redi made his.

The most that can be concluded from hence, I think, is this, that although the vipers in Italy do not differ in their nature from those in France; yet there is a great deal of difference in the success of the same experiments, when faithfully and judiciously made, and when they are cautiously and timorously managed, lest they should happen to overthrow a darling hypothesis.

And therefore Monsieur du Verney in the Royal Academy, and Dr Areskine, then at Paris, confirmed the opinion of Signor Redi, by several trials which they made with the same effect; as I was afterwards informed by the Doctor himself.

We resolved to end our poison-inquiries by tasting the venomous liquor. Accordingly, having diluted a quantity of it with a very little warm water, several of us ventured to put some of it upon the tip of our tongues. We all agreed, that it tasted very sharp and fiery, as if the tongue had been struck through
with

with something scalding or burning. This sensation went not off in two or three hours : and one gentleman, who would not be satisfied without trying a large drop undiluted, found his tongue swelled with a little inflammation, and the soreness lasted two days. But neither his nor our boldness was attended with any ill consequence.

This is no objection to the hurtful quality of this juice : for as some chemical liquors ferment with others of a certain kind only ; so these poisonous salts may affect one fluid of the body, and not another. Which that is, we shall shew anon. It is sufficient to the present purpose to say, that the saline spicula are broken and dissolved in the mouth by the clammy salival humour : and if any of them should pass thence into the stomach and intestines, the balsam of the bile will be an antidote there, powerful enough to overcome their force.

These experiments upon the viper-poison and the blood, are a sufficient confirmation of what has been advanced in the introduction, that the nervous liquor only is affected by this venom ; and at the same time afford a convincing proof, how much those scanty principles of our chemists, acid and alkali, fall short in explaining the actions of natural bodies : since neither of these salts could in any way be found to affect the viperine venom.

Before I proceed, I must take notice, that even some of the ancients were thus far rightly apprised of the nature of this poison. Of this Galen gives us testimony in several places ; particularly in his book *de temperamentis* *, where he takes notice,

* Lib. iii. cap. 2.

that "nothing has the same power upon the human body outwardly as inwardly. Thus," (says he), "neither the venom of the viper, nor of the asp, nor frothy spittle of the mad dog, are alike mischievous when they fall upon the skin, or enter into the stomach, as when outwardly communicated by a wound."

And therefore Lucan (who being an historical poet, makes amends for what is wanting of invention, by the spirit and judgment always shewn in his descriptions) introduces brave Cato, when marching the remains of Pompey's army through Africa, very wisely telling the soldiers, almost choked with thirst, yet afraid to drink of a spring they came to, because full of serpents * :

*Noxia serpentum est admisto sanguine pestis :
Morsu virus habent, et fatum dente minantur ;
Pocula marte carent——*

* Mix'd with the blood, the serpent's poison kills;
The bite conveys it ; death lurks in the teeth :
Swallow'd it works no harm——

In the like manner it was in those times also known, that the virulent juice had the same bad effects, when mixed with the juices of the body, by means of a common wound, as when communicated by the venomous bite. This made Celsus † advise, in sucking out the poison, to take care there be no ulcer in the mouth : though this caution be rather slighted and ridiculed by Severinus ‡ and others ;

* Lucan. Pharsal. lib. ix. ver. 614.
ante citat.

† Loc.
‡ Vipera Pythia, p. 361.

who

who hereby discover how little they understood of the feat and nature of this poison. And Galen * mentioning the story of Cleopatra, relates from other authors, that she killed herself by pouring the virus of an asp into a wound made in her arm by her own teeth.

In short, it is upon this foundation that Pliny † assures us, the Scythians poisoned their arrows with the sanies of vipers mixed with human blood. The way of doing it Aristotle ‡ has at large related; and the Tartars are said to use the like trick to this day. After the same manner the Indians make use of the venom of the lizard, called *Gecco*. This creature they hang up by the tail, and by whipping exasperate it till it discharge its virus, in which they tinge their darts: and a very slight wound with these weapons is speedy death ||.

A later author, in his description of the cape of Good Hope †, informs us, that the way by which the inhabitants there, called *Hattentots*, kill great wild beasts, lions, tigers, elephants, &c. is this: They take the bladders of poison with their liquor out of the gums of that deadly kind of serpents, which the Portuguese call *Cobras de Capello*: these they dry in the sun, and grind them to powder betwixt two stones: this powder they make into a paste with the spittle or slabber of the same creature: which paste they rub

* De Theriac. ad Pison. lib. i. c. 1. Vid. etiam c. 10.

† Nat. Hist. lib. xi. c. 53. Scythæ sagittas tingunt viperina sanie et humano sanguine: irremediabile id scelus.

‡ De mirabilibus.

|| Bont. Histor.

Ind. lib. 5. c. 5.

† Peter Kolben, printed at Norimberg, in High Dutch, 1719, pag. 532.

upon the points of their darts, and lay them by to dry for their use,

Having in the introduction explained in general the manner in which this poison, in common with all others of the animal kind, acts upon the body; I shall only here add the reason of one particular effect of it, which is thought very extraordinary and surprising, that is, the jaundice.

The jaundice is a suffusion of bile upon the surface of the body, and indeed upon all the inward membranes also. The bile is a natural sapo, that is, a mixture of oil, water, and a salt both volatile and fixed, separated in the liver. That the secretion of it may be rightly performed, it is requisite (as in all animal secretions) that there be a due proportion of its several parts, and also that there be a right disposition of the secretory vessels. These compounding parts cannot be supposed to be altered in so short a time as is here mentioned: but a constriction, or nervous spasms, may almost suddenly so straiten the orifices of the ducts, into which the bile is to pass, that its derivation into them will be stopt; and consequently it must remain in the blood, which, in the course of circulation will discharge it upon the whole body.

This is a jaundice of the same kind with that which follows sometimes upon violent colic pains, in which the spasmodic contraction of the membranes of the abdomen interrupts the motion of the bile through the hepatic canals: the cure of which therefore is by plentiful dilution and anodyne medicines.

The case is quite otherwise in the common jaundice, which is a disease of the liver. In this the fault
lies

lies in the bile itself. For though it is usually said, that this is an obstruction in the liver; yet it ought to be considered, that the vessels are rarely obstructed but by the disorder of the liquors they carry; and consequently that an ill state of the bile must be, except in some extraordinary cases, antecedent to an obstruction in its ducts: and therefore, as the alterations of so compounded a fluid are different, so the jaundice is accordingly attended with different, nay, sometimes with contrary symptoms. In some cases, without a fever, the fæces of the intestines are hard and white with great costiveness: in others a diarrhoea with a fever, and yellow discharges, weakens the patient. In the former (the consequent generally of an inactive sedentary life), for want of a due quantity of salt, the oily part of the bile grows viscid and thick, and stagnates in the ducts of the liver: in the other (owing to plentiful living, and drinking spirituous liquors) the volatile part of the salt prevails too much, and the bile becomes too thin, hot, and irritating.

There is another disease, which though it be thought to belong to another part, yet is indeed so much akin to the jaundice, that it may be properly mentioned on this occasion; I mean the diabetes. For this is not, as physicians have commonly judged, a distemper of the kidneys, but of the liver, proceeding likewise from a vitiated mixture of the bile. It happens most frequently to those who without due exercise indulge themselves in drinking vinous liquors, and then quench their thirst arising from these, by too great a quantity of such as are cooling.

By such ill-timed heating and cooling of the hu-

mours of the body, the natural proportion of salt in the bile, by which its oily part is incorporated with the water, is not sufficient, now the water over-abounds, to preserve the mixture: so that a great portion of this, together with some of the thinnest of the oil, will be discharged by the kidneys; and the urinary ducts will be greatly enlarged by a constant afflux that way. By which means the thicker oily particles are left in a degree of coagulation in the smaller tubes of the liver, and are there formed into a hard fatty substance.

The dissection of those who have died of the diabetes, proves this to be so: for I have always found a steatomatous collection in their liver, in appearance not unlike to what is often discharged by stools in a confirmed jaundice, but of a harder consistence.

As to the sweetness of the urine, this is all-bilious: for the water of the bile separated from its salt is sweet. Ox-gall, by a chemical distillation, yields four parts in five of water *. This I have observed to be fragrant, as if perfumed with musk. The urine in the beginning of a jaundice very often smells like violets; and in a diabetes the flux is usually lessened towards the latter end of life, and the water is as bitter as gall: plain indications of a like origin of two distempers seemingly very different. Neither can I omit to take notice, that the cure of a diabetes confirms these remarks: for this is chiefly done by supplying the blood with a quantity of fixed salt, particularly such as is contained in lime-water, and in that of the hot-well at Bristol, which is indeed a natural lime-water. But what might be said on this subject

* Vide Haller. Not. in Boerhaav. Institut. Medic. § 99.

would

would require a just discourse. It is time to come to the cure of the viper-poison.

There was formerly in Africa a nation of people called *Psylli*, famous for the cure of the bite of serpents, with which that country above all others abounds. These people were thought to have something in their constitution so contrary to poison, that no venomous creature would touch them : and it was pretended, that they made this a trial of the legitimacy of their children. The truth of the matter is : They performed the cure in a manner very surprising to the vulgar, that is, by applying their mouth to the wound, and sucking out the venom. The Marfi in Italy pretended to the same power *. Some ceremonies, to overawe the patient, and gain reverence to the operator, were added to the performance : but Celsus, the Latin Hippocrates, has wisely observed, that “ these *Psylli* had no particular skill in this management, but boldness confirmed by use : for the “ poison of the serpent, as likewise some hunting “ poisons, which the Gauls particularly make use of, “ are not hurtful in the mouth, but in a wound. “ Therefore whosoever will, after their example, “ suck the wound, will be in no danger himself, and “ will save the life of the wounded person †.” Aristotle has hinted something to this purpose. “ The

* Vide Plin. Hist. Nat. lib. 7. c. 2. Ælian. Hist. animal. lib. 1. c. 57. et Lucan. lib. 9. ver. 891. † Neque hercule scientiam præcipuam habent hi, qui *Psylli* nominantur, sed audaciam usu ipso confirmatam. Nam venenum serpentis, ut quædam etiam venatoria venena, quibus Galli præcipue utuntur, non gustu, sed in vulnere nocent. Ergo quisquis, exemplum *Psylli* secutus, id vulnus exfuxerit, et ipse tutus erit, et tutum hominem præstabit. Medicin. lib. 5. c. 27.

“ spittle

“ spittle of a man” (says he) “ is an enemy to the bites
 “ of most serpents *.” And Nicander observes,
 “ That serpents fly from even the smell of human
 “ spittle †.”

Pliny expresses the thing still in a stronger manner,
 and affirms, “ That there is in all men a poison
 “ which kills serpents; and that these creatures run
 “ away from spittle, as they will from the touch of
 “ scalding water ‡.”

It may therefore justly seem strange, that, upon
 so good an authority as that of Celsus, (who general-
 ly gives us the methods of the Greek physicians and
 surgeons), so beneficial and easy a practice as this of
 the Psylli should not have been perpetuated by physi-
 cians. But the notion, that a poison so fatal in a
 wound, could not be taken into the mouth, without
 hurt, was, no doubt, the obstacle; especially when
 it was imagined, that outward applications would
 answer the purpose as well, without any hazard.

However, this method of cure ought, I think, to
 be revived: and there happened, about three years a-
 go, in London, a very remarkable case, which con-
 firms the success of it.

The story is this, as related to me by an ingenious
 and experienced surgeon, who saw the case at the lat-
 ter end of it. A man was bit on one of his fingers
 by a rattle-snake, just then brought over from Virginia.
 He immediately put his finger into his mouth, and
 sucked the wound. His under-lip and tongue were
 presently swelled to a great degree: he faltered in

* Hist. Animal. lib. 8. c. 29. † Πολλάκις καὶ βορρίων
 σιάλων ὑποείτρεσαν ὀδμήν. Theriac. ver. 86. ‡ Omnibus
 hominibus contra serpentes inest venenum, feruntque i-
 ctum salivæ, ut ferventis aquæ contactum, fugere. Loc. cit.

his speech, and in some measure lost his senses. He then drank a large quantity of oil, and warm water upon it, by which he vomited plentifully. A live pigeon was cut in two, and applied to the finger. Two hours after this, the flesh about the wound was cut out, and the part burnt with a hot iron, and the arm embrocated with warm oil. He then recovered his speech and his senses. His arm continued swelled the next day, but by common applications soon grew easy, and the patient suffered no farther mischief.

As the poison of this snake is more quick and deadly than any other that we know, a remedy for this will most certainly prove effectual against that of smaller vipers, and all other creatures of this kind. The other applications here made use of (the vomit excepted) could be of no service. The pigeon; the cutting and burning the part, two hours after the wound had been made, did no good. Embrocating the arm with oil only abated the swelling. Therefore the physicians of the royal academy at Paris gave a right judgment of this application, in a like case. An account having been given in our Philosophical Transactions * of an experiment made, in which it was pretended that common oil, rubbed into the wound, had cured the bite of a viper; they with all possible care made several trials with it, and pronounced it to be ineffectual, any farther than as it might be a fomentation to the tumefied part †.

The first thing then to be done upon the bite of a viper of any kind, is, that the patient should immediately suck the wound himself, if he can come at it: if he cannot, another person should do this good of-

* N^o 443.

† Mem. Acad. Sc. Par. an. 1737.

fice for him. Whoever does it, ought (to prevent any inflammation of the lips and tongue, from the heat of the poison) to wash his mouth well beforehand with warm oil, and hold some of this in the mouth while the suction is performing.

After this is over, it will be proper to give a vomit. A dose of Rad. Ipecacuan. encouraged in the working with oil and warm water, may be sufficient. The good effect of this is owing to the shake which the action of vomiting gives to the nerves; whereby the irregular spasms, into which their whole system might be drawn, are prevented.

To confirm this practice, I have been assured by an ingenious surgeon, who lived in Virginia, that the Indians there cure the bite of the rattle-snake, by sucking the wound, and taking immediately a large quantity of a decoction of the Seneca rattle-snake root, (which vomits plentifully), and laying to the part the same root chewed.

As to any other external management, I think it can avail but little; since it cannot prevent the sudden communication of the poison to the nerves. Burning the part with a hot iron, is of no use. Dry salt upon the wound, recommended by Celsus *, promises somewhat more, but not much. The celebrated snake-stones, brought from the East Indies, and said to be taken out of the head of the Cobra de Capello, have no virtue to be depended on. This Signor Redi †, Monsieur Charas ‡, and myself have experienced. They will indeed, when applied, stick to the wound for some time; being, as appears from their

* Lib. 5. c. 27.
naturali.

† Esperienze intorno alle cose
‡ Pag. 66.

make,

make, not natural but factitious bodies, compounded most probably of calcined bones, and some testaceous substances mixed together : but when they drop off, they are found to have imbibed nothing of the venom.

More is to be said for the remedy of our viper-catchers, in which they place so much confidence, as to be no more afraid of a bite than of a common puncture ; immediately curing themselves by the application of their specific.

This, though they keep it as a great secret, I have however, upon strict inquiry, found out to be no other than the axungia viperina presently rubbed into the wound. And to convince myself of its good effects, I enraged a viper to bite a young dog in the nose : both the teeth were stuck deep in ; he howled bitterly, and the part began to swell : I diligently applied some of the axungia I had ready at hand, and he was very well the next day.

But because some gentlemen, who saw this experiment, were apt to impute the cure rather to the dog's spittle, (he licking the wound), than to the virtue of the fat ; we made him to be bit again in the tongue, forbearing the use of our remedy ; and he died within four or five hours.

At another time I made the like trial with the same success.

As this axungia consists of clammy and viscid parts, which are withal more penetrating and active than most oily substances ; so these, without all doubt, may, if immediately applied, involve, and as it were sheath, the volatile salts of the venomous liquor, and thus prevent their shooting out into those
crystalline

crystalline spicula, which we have observed to be the main instruments of that deadly mischief that attends the bite.

But even this cure ought not to be relied on. It is safest to use the method we have mentioned: and moreover, if the patient feels any sickness, faintness, or any of the nervous symptoms we have described; he must be put into bed, and a sweat must be promoted by cordial medicines, particularly the confect. Raleigh. and the salt of vipers, or, in want of this, salt of hartshorn, given in warm wine. I have often experienced the good effects of this proceeding: and after all the pretensions of the cure by oil, in the case above related *, the man was really not recovered without these means.

I shall conclude with some hints concerning the use of the viper in physic; because authors are very large in enumerating its virtues against many, and some of them, very obstinate distempers.

One of the first whom we find in antiquity to have made use of the flesh of this creature to medicinal purposes, was, I think, Antonius Musa, the famous physician to Octavius Cæsar; of whom Pliny † tells us, “ That when he met with incurable ulcers, he ordered the eating of vipers, and by this means they were quickly healed.”

It is not improbable, that he might have learned this from the great Greek physician Craterus, mentioned often by Cicero in his epistles to Atticus; who, as Porphyrius ‡ relates, “ very happily cured a miserable slave, whose skin in a strange manner

* Phil. Transact. No 443.

† Lib. xxx. c. 13.

‡ De abstin. ab animal. lib. i. p. 16.

“ fell

“fell off from his bones, by advising him to feed upon vipers dressed after the manner of fish.”

Be this as it will, in Galen's time the profitable qualities of the viper were very commonly known. He says, that they who are afflicted with the elephantiasis, are wonderfully relieved by eating vipers, dressed like eels; and relates very remarkable stories of cures of this disease, performed by the viper-wine*.

Aretæus, who most probably lived about the same time with Galen, and of all the ancients has most accurately described the elephantiasis, commends, as Craterus did, the eating of vipers instead of fish in the same disease†. And to this purpose I remember, that as Lopes‡, in his relation of the kingdom of Congo in Africa, takes notice how greedily the negroes eat adders, roasting them, and esteeming them as the most delicious food; so Dampier|| also informs us, that the natives of Tonquin in the East Indies treat their friends with arrack, in which snakes and scorpions have been infused, accounting this not only a great cordial, but also an antidote against the leprosy, and all other sorts of poison.

I have since been told by a learned physician, who resided many years at Bengal, that it is a constant practice there to order in diet the Cobra de Capello (the viper of that country) to persons wasted by long distempers.

The physicians in Italy and France very commonly prescribe the broth and gelly of vipers flesh for much

* De arte curat. ad Glauc. lib. ii. c. 10. & De simpl. medic. facult. lib. xi. c. 1. † Curat. diaturn. lib. ii. c. 13.

‡ Vid. Purchas's pilgrims, part 2. book. vii. chap. 4. § 3. || Voyages, vol. 2. part 1. p. 53.

the same uses, that is, to invigorate and purify the mass of blood exhausted with diseases, or tainted with some vitious and obstinate ferment.

From all this it appears, that the main efficacy of the viperine flesh is to quicken the circle of the blood, promote its due mixture, and by this means cleanse and scour the glands of those stagnating juices, which turning to acidity, are the origin of many, at least, of those troublesome distempers in the surface of the body, which go under the names of scrophulous, leprous, &c.

These good effects are owing to that penetrating, strong salt, with which the substance of these creatures does, in a very great proportion, abound; and the reason of this is from the food they live on, which we have observed before to be lizards, moles, &c. whose nature every one knows to be such as must necessarily, when they are dissolved in the stomach, supply the blood with a great quantity of active and volatile parts. And herein lies the difference between the flesh of vipers and that of other innocent serpents, which feeding chiefly upon grass, herbs, &c. do not recommend themselves to us by any of those properties, which are in so eminent a degree found in the former.

Whosoever reflects on what has been said on this head, will very readily acknowledge, that our physicians deal too cautiously or sparingly with a remedy, which may be applied to very good purposes, when they prescribe a few grains of the powder of dried vipers, or make up a small quantity of their flesh into troches. Whereas, that service may really be done this way, the patient ought to eat frequently of viper-gelly,

gelly, or broth; or rather, as the ancient manner was, to boil vipers, and eat them like fish; or if this food will not go down, (though really very good and delicious fare), to make use at least of wine, in which dried vipers have been digested six or seven days, in a gentle heat *, from which I have seen very good effects in obstinate lepras; or lastly, (in some cases especially, where wine is not convenient), to take either the powder, or good quantities of the viperine salt, in which alone the virtue of all medicines made from this creature resides. And therefore the salt of any other animal, which is still more pungent and stimulating than this, (as is particularly that of Cantharides), is yet a more powerful remedy in dry and scaly leprous eruptions; which may without any inconvenience be given in the form of a tincture made with spirit of wine †.

A N A P P E N D I X,

Containing an anatomical description of those parts in a viper, and in a rattle-snake, which are concerned in their poison:

With a short account of some other venomous animals.

IN order to give a full view of the instruments of death in a viper, and that larger species of it, the rattle-snake, I shall explain the figures drawn from dissections of them both, beginning with the lesser a-

* Vid. Pharmacop. Lond. † Vid. eand. Pharmacop.

nimal, and ending with the bigger. And if some things are repeated in the latter, which had been observed in the former, this will not be thought tedious: because, in subjects so minute, it is sometimes necessary to represent the same parts in different situations and connections, that the uses assigned to them may be the more clearly understood. And for this reason, I shall not follow the order of the figures, so much as I shall the thread of the description which they are designed to explain.

T A B L E I.

Exhibits several views taken from the head of the common viper.

Fig. 1. shews a side-view of the scull and jaws: in which

a. Represents two poisoning fangs on each side, fixed (in a manner to be described hereafter) in a solid bone on each side *b.* These solid bones are articulated by a ginglymus, as it were pendent to the two zygomata: upon which, with the poisoning fangs, they receive two motions; *viz.* production, by which the fangs are erected; and retraction, by which these fangs are brought in, and couched against the roof of the mouth, so as to admit of closing the jaws.

Fig. 5. *a.* shews these fangs magnified.

These motions are produced by a thin slip of bone fig. 1. *c.* and fig. 5. *d.* which being connected to the bone *b.* below its articulation, makes it to join in the motions of production and retraction, which it receives itself, by being connected to the bone, fig. 5.

e. which is produced and retracted as well in conjunction with the under jaw, to which it is connected, as by the action of muscles properly formed and subservient to itself.

Fig. 1. *f.* shews the under jaw, and *d. e.* its two fulcra, by the help of which it receives variety of motions necessary in swallowing its prey.

Fig. 6. shews these two fulcra *a* and *b*, by the intervention of which the under jaw is connected to the sinciput and temporal bone.

In order to understand the manner by which the viper swallows its prey, it must be observed, that the upper and lower jaw on one side move independently of the upper and lower jaw on the opposite side; so as that the upper and lower on one side can be protruded or retracted, while the correspondent parts on the opposite side are either employed in contrary motions, or held firm and unmoved; and being furnished with small teeth firmly connected to their surfaces, which from their office we may term holders, fig. 1. *g.* and fig. 5. *e.* they are capable of drawing down their prey, by alternately retracting the two jaws on each side.

These holders are more numerous in the upper, than in the lower jaw.

Fig. 5. *c.* shews them in the upper jaw.

Fig. 6. *d.* shews them in the lower.

Fig. 4. shews the top of the skull: in which

a. The sinciput is composed of one bone, which in man is formed by the concurrence of the two parietal bones: whereas the frons *b*, which in man is one bone, is in this animal divided into two by a future.

c. Shews the antierour edges of the orbit of the eye formed by the frontal bone.

d. The ossa nasi.

e. The maxillary bone in this animal no way divided.

Before we leave the bones of this part, we must observe, that the poisoning fangs are different from the holders in other circumstances, besides their magnitude and motions. And first I must remark, that though there are two poisoning fangs on each side, yet it rarely happens, that they are both firmly fixed in the sockets designed for their reception. I have observed sometimes, that the external fang on each side was loose, and sometimes the internal fang on each side was loose; and sometimes the internal on one side, and the external on the other side were loose: and that, in protruding the fangs, that which was firmly fixed, was more erected than that which was loose; which it likewise always exceeded in length. From all these considerations, joined to some circumstances hereafter to be explained, I have been induced to believe, that the viper employs but one fang at a time; nature having so contrived, that the whole poison prepared on one side shall as effectually be lodged in the prey by the action of one fang, as by both, and thus be sufficient to answer its purpose.

As the fang of the viper describes an arch of a circle in wounding its prey, so its force and strength are greatly secured by its curve form, resembling nearly the claw of a bird, fig. 1. a, and fig. 5. a. But as this form is necessarily attended with a great difficulty in disengaging it again from the part into which it is struck; it must often happen, that its prey, in

in springing away on being wounded, must break off the fang: and the rather because the viper, finding itself pulled away by the motions of its prey, will probably lash about its tail; till, fixing itself by it, the fang is obliged either to disengage itself, or to break off short at the socket, which is its weakest part. To remedy this inconvenience, the fang, which before was loose, probably soon becomes fixed; and the broken fang falling out, another new one is fixed (though loosely) in its place. For, to supply this loss or breaking of fangs, we always find a cluster of young fangs of different degrees of perfection, lodged in the bag near the roots of the poisoning fangs: of which I have counted six on one side in a rattle-snake. I shall not attempt to conjecture, by what means these subsidiary fangs are from time to time conducted to the empty sockets; the several circumstances mentioned being sufficient to incline us to believe, that they serve for that purpose; as the life of the animal manifestly requires such a supply for its preservation.

These poisoning fangs are hollow from near the edge of the socket to near the point. This hollow begins by an orifice in the forepart of the tooth, fig. 2. *a*. and terminates at some distance above the apex *b*; from whence the fang is exceeding hard and solid, and sloped off, so as to resemble in some measure the common tooth-pick.

Fig. 3. represents this hollow of the tooth, by splitting it through its axis.

The apparatus for preparing and injecting the poisonous fluid consists in a gland, fig. 9. *c*. situated on each cheek: in which situation it is firmly connected to the sinciput at its commissure with the occiput by the
the

the ligament *a*, and to the posterioir extremity of the lower jaw by the ligament *b*. From these ligaments continued on its surface the gland is furnished with a strong albugineous coat, proper to strengthen it against the great distensions which it must suffer in accumulating its fluid, and the violent compressions in emitting it.

The same integument continued on forms the excretory duct *e*, by which the poison is conveyed from the gland into the cavity of the erected fang, by the assistance of a bag or purse, fig. 7. and 8. *a*. in which the two poisoning fangs are on each side contained.

f. Shews a small white gland, which, from its situation near the fangs, has been supposed to be the organ for secreting the poison; though probably it is no more than either a lymphatic or a salival gland; and is entirely wanting in the rattle-snake.

All the muscles subservient to the action of biting are in this animal so situated, as to bear strongly upon the poison-gland during their action; thereby conspiring to ejaculate its fluid.

But the chief part in this ejaculation of the poison is performed by the muscle *d*, which arising from the inferiour maxilla runs obliquely upwards under the poison-gland, till passing between the two ligaments *a* and *b*, it reflects itself upon the external side of the gland, and running parallel with its length, is firmly attached to it. By the assistance of the ligament *a*, which in some measure serves as its tendon, this muscle must contribute to closing the jaws: but its greatest action is, to squeeze the poison-gland, which it nearly surrounds; in the same manner as we usually squeeze an orange, in order to express its juice.

The

Fig. 1.



Fig. 7.



Fig. 2.



Fig. 3.



Fig. 8.



Fig. 4.

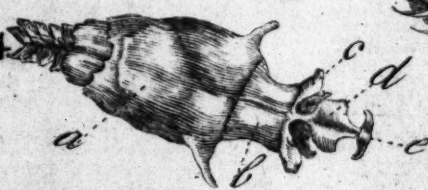


Fig. 9a



Fig. 5.



Fig. 10.

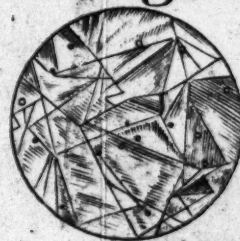


Fig. 6.



The disposition of this muscle upon the surface of the gland in a continued course with the direction of its duct, and the terminating of this duct (which appears tendinous) at the roots of the fangs, were circumstances, which raised an opinion, that this was altogether a muscle subservient to their retraction: the contrary of which will however appear by immersing the head, when excoriated, in hot water; after which the muscle will easily separate, and leave the gland naked to view.

Fig. 7. shews the head of the viper not dissected: in which

a. Shews the two poisoning fangs on each side inclosed in their proper bags, in which the different degrees of extension or erection are easily observed.

b. Shews the entrance into the trachea, so situated, as to be least liable to being compressed in the action of swallowing.

c. Shews the tongue, by which the viper laps the dew; and by whose action possibly the subsidiary fangs are placed in the empty sockets, as occasion may require.

Fig. 8. represents the bag enveloping the two fangs, as it appears when considerably magnified; whereby the fimbriated or scalloped edge is more distinguishable. But the particular structure and office of this bag will be better explained, by viewing it bigger in the rattle-snake.

TABLE

T A B L E H.

Shews five views taken from the head of an exceeding large rattle-snake : of which

Fig. 1. *a.* represents the maxillary bone.

b. The ossa nasi.

c. The os sphenœides.

d. The os sincipitis.

e. The two ossa frontis.

f. The os temporum, with the os auditûs like that of birds, but standing nearly parallel to the spine.

g. The os occipitis.

h and *i.* The two fulcra of the inferiour maxilla.

k. The bone, in whose sockets the two poisoning fangs are received, connected by a ginglymus to

l. The zygoma.

m, m. The moveable bone of the upper jaw furnished with its holders ; in which bone a joint may be observed at fig. 2. *x.* at which joint it becomes curved, when

n. Fig. 1. a smaller splinter of bone, connected by one extremity to the former, and by the other to the bone containing the fangs, is so protruded, as to erect the fangs.

o. The posterior extremity of the under jaw extended beyond its fulcrum, in order to increase the power of a small muscle serving to open it, fig. 2. *g.*

p. Shews a process of the under jaw analogous to the corone in other animals, into which the great elevator is inserted.

Below this process externally may be observed a large

large foramen, *q*, by which the blood-vessels and nerves enter : which, after supplying branches to the periosteum and medullary substance, pass out again at a large internal foramen, *w*. fig. 1. leaving some few twigs, which proceeding further pass out at two small foramina, *u*, and are spent upon the gums and under lip.

t, t. Shew the holders in each jaw, which do not appear to be connected by a gomphotic articulation, but fixed by ligaments into shallow pits or inequalities designed for their reception.

r. Shews the poisoning fangs fixed in their sockets, as they appear when almost fully erected. For a supply of these fangs, when accidentally broke out,

s. Shews several subsidiary teeth of different magnitudes in their natural situation.

Fig. 2. Shews the same head, with its poison-gland, and the several muscles subservient to the motions of the jaws, as they appear in their natural situation.

a. Shews a muscle, which, by being inserted behind its fulcrum, serves to open the under jaw.

b. A muscle inserted immediately before its fulcrum, serving to elevate or close the jaw.

But the most active muscle in closing the mouth and jaws seems to be *h, i*, which arising from the os sincipitis, and passing down behind the poison-gland, is inserted into the under jaw at such a distance from its fulcrum, as to have the advantage of all the other muscles.

d and *e*. Shew the two ligaments, by which the gland is fixed to the edge of the sinciput and the extremity of the under jaw.

l. Shews the body of the poison-gland, covered by

by an albugineous coat formed by an expansion of the two ligaments mentioned.

The same albugineous coat continued forms a large duct, *f*, by which the poisonous fluid is conveyed from the gland to the bag *c*, which envelops the poisoning fangs.

Now, although it has been observed, that the muscles *b*, and *h*, *i*, are so situated as to bear against the gland during their action, thereby assisting to expel the poison; yet the greatest power in expelling the poison seems to be in the action of the muscle *k*; which arising from the under jaw, and passing obliquely upwards behind, and in contact with the poison-gland, reflects itself forward between the two ligaments; and, after extending itself over almost the whole gland, is firmly implanted into its fore and lower part; serving thereby both to compress and contract the whole gland, and so to expel its fluid.

Fig. 3. gives a more distinct view of this gland surrounded by its proper muscle.

a. Shews the poison-gland.

b and *c*. Its two ligaments.

d. Its duct.

e. and *f*. The muscle surrounding it, which serves both to close the mouth in biting, or wounding its prey, and at the same time to expel the poison.

From this view it is obvious, why a less accurate examination (in so small an animal as a viper, and whose muscles, being white, are therefore less distinguishable from other substances) might lead inquirers into an opinion, that the whole together was a muscle sending off a round tendon, and serving to draw the fangs inward.

Fig.

Fig. 4. represents an under view of the same head : in which

a. Shews the superiour orifice of the poisoning fangs in their retracted state.

b. Their inferiour orifice.

c. Shews the fangs as covered by their bag, when in a retracted state ; which bag is cut open on the opposite side, in order to shew the fangs. And

d. A fimbriated septum attached to the orifice of the poison-duct, and dividing the fangs from each other.

e. Shews the poison-gland, in whose duct two bristles are placed, which, passing into the sacculus at its summit, shew the entrance of the poison-duct *f.* exactly between the superiour orifices of the two fangs : through which orifices the bristles entering the fangs pass out at their slits.

Fig. 2. *c.* shews this bag, whose edge is fimbriated, when stretched and expanded during the erected state of the fangs.

From this appearance it has been imagined, that the poison being discharged into the bag, and the bag being gradually pressed up to the summit of the fangs by the sides of the wound, as the fangs were impelled deeper and deeper, this pressure of the bag, acting upon its contained fluid, would be sufficient to force and direct the poison through the fangs into the bottom of the wound. But the loss of the fluid, which would partly escape at the gutter necessarily made by the contact of two cones, and (if their contact be not very close) between them too, with the waste of some, which would be left in the bag, have induced me to believe, that the immission of the poi-

son into the wound depends on circumstances very different.

I have been led to think, that, to lessen the inconvenience of breaking the fangs, one fang only, and on one side only, is erected, at one bite, as I have before hinted; and that, by being erected, its superiour orifice is brought nearly in contact with the orifice of the poison-duct: and that, as the poison-duct enters the bag exactly between the fangs, so the bag may serve to guide the duct to this or that side, according as this or that fang happens to be erected; thereby making the poison-duct and the hollow of the fang one continued tube or canal.

In order to this we need only to suppose, that the fimbriated septum, which divides the two fangs, is more elastic, or yields more easily, than the sides of the bag. In this case the fang by its erection stretching the bag, the septum being weakest will follow this stretch; and its extremity, to which the orifice of the poison-duct is attached, be carried to this or that side, so as to meet this or that orifice, as the pressure or erection may happen to be in this or that fang.

Fig. 5. shews

A. The part of the bag, which yields with the septum to the pressure of erection in the fang.

B, and C. The sides of the bag, which admitting no stretch themselves, may throw the whole motion on the septum and the part A.

d, d. Two arches, of either of which any necessary part may be described by the motion of the orifice of the duct, in consequence of the septum's yielding more easily than the sides of the bag. The orifice
of

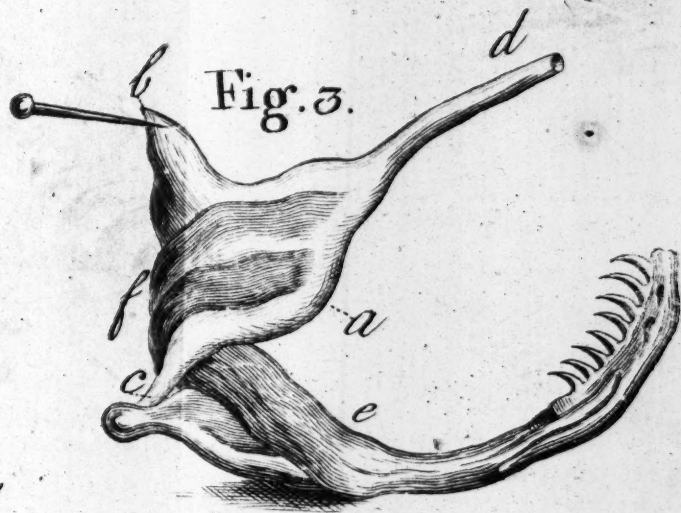
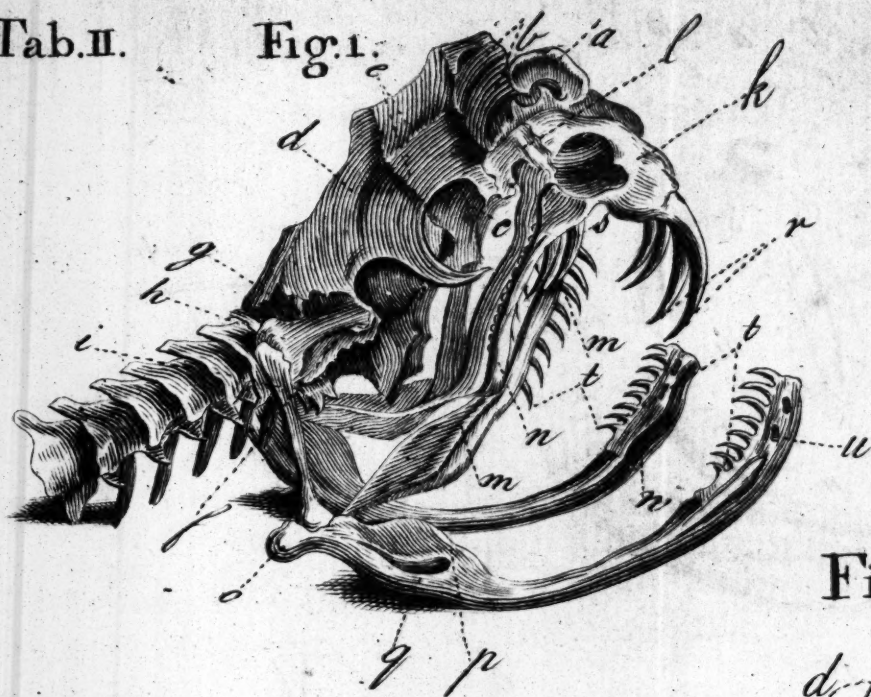


Fig. 5.

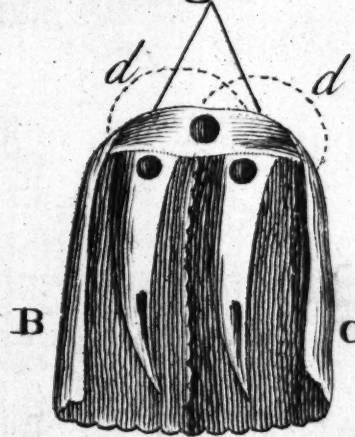


Fig. 4.

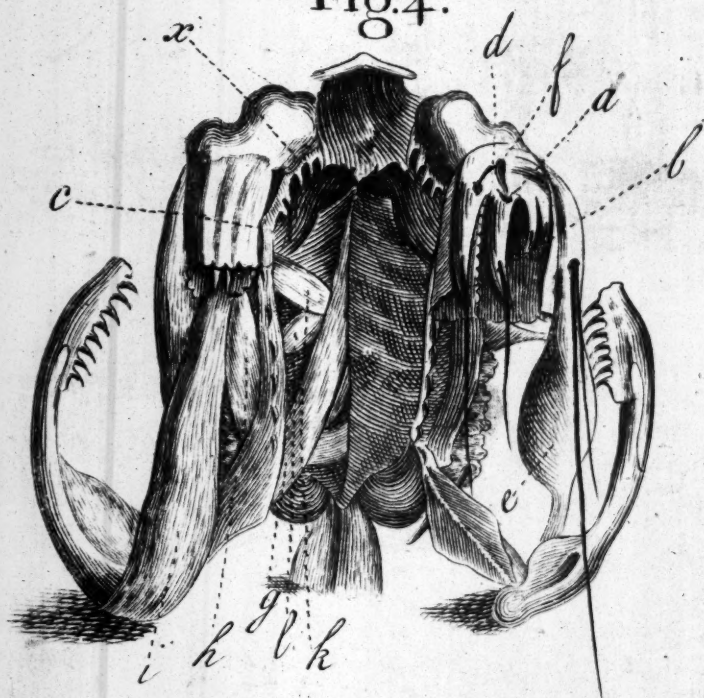
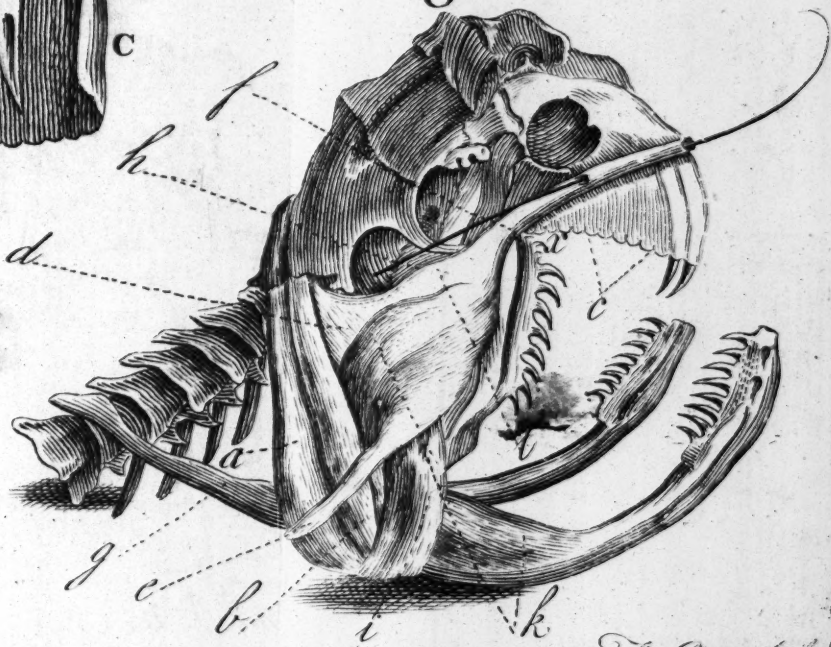


Fig. 2.



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of the duct thus changing its situation, may be applied to the orifice of either of the fangs occasionally, and the whole poison prepared by the gland be employed in the action of one single fang: the advantages of which to the viper itself have been already explained.

Fig. 4. *g, b, i, k, l.* Muscles subservient to the motions of the jaws, whose actions sufficiently appear by their situations and directions.

To this most accurate description by Dr Nicholls, I think it not amiss to subjoin a remark, concerning the use of the rattle at the tail of this snake, which has its name from it; because a vulgar error has obtained, even among the learned, about it.

It is commonly said, that this is a kind contrivance of divine providence, to give warning to passengers, by the noise which this part makes when the creature moves, to keep out of the way of its mischief. Now, this is a mistake. It is beyond all dispute, that wisdom and goodness shine forth in all the works of the creation: but the contrivance here is of another kind than is imagined.

All the parts of animals are made either for the preservation of the individual, or for the propagation of its species: this before us is for the service of the individual. This snake lives chiefly upon squirrels and birds, which a reptile can never catch without the advantage of some management to bring them within its reach. The way is this. The snake creeps to the foot of a tree, and by shaking his rattle, awakens the little creatures which are lodged in it: they are so frightened at the sight of their enemy, who fixes his lively piercing eyes upon one or other

of them, that they have no power to get away, but leap about from bough to bough, till they are quite tired; and at last falling to the ground, they are snapped into his mouth. This is by the people of the country called charming the squirrels and birds.

It must likewise be observed, that this snake does not make any noise with its rattle in the common motions of its body.

There is something like this in the lion's hunting for his food. The hungry tyrant, by his terrible roaring in the woods, rouses the lesser beasts out of their holes: they running about in fright and surprise, are easily seized, and become a prey to his devouring jaws.

And I have myself seen, upon a hawk's settling upon a tree in a garden, the little birds all about it so struck with fear, that though they could fly backwards and forwards, for some little distance, yet they have not been able to get away from the ravenous destroyer.

POISONOUS ANIMALS.

AS the viper is hurtful by instilling a liquid poison into the wound made by its teeth; so likewise all venomous creatures whatsoever, whether they bite or sting, though there be some difference in the contrivance of their organs, are mischievous after much the same manner; and the most considerable of them for the same good use and purpose, that is, in order to kill their prey.

This will fully appear, by examining the instruments of death in several of them.

First,

First, then, the spider, which lives upon flies, wasps, and the like insects, is provided with a hooked forceps, placed just by the mouth, very sharp and fine: with this he pierces the flesh of little creatures caught in his web, and at the same time infuses a juice into the puncture; by which means the animal being killed, he sucks out the moisture from the body, and leaves it a dry husky carcase.

Mr Van Leeuwenhoek, in his account of spiders, published in the Philosophical Transactions *, has, together with the other parts, by the help of his glasses, described these weapons; which he finds to lie couched on each side the mouth, in a row of teeth, till they are raised to do execution. These rows of small teeth are designed to hold the prey, that it may not escape the force of the bite. And in the convex part, towards the point of each claw, he has delineated a little aperture or slit, through which he supposes the poison issues out at the same time the wound is made.

This situation and motion of these parts I have several times viewed; but was never able to discern the outlet or opening; which having a just deference to the industry and application of so nice an observer in things of this nature, I, at first, imputed to my own unskilfulness in such inquiries, knowing my microscope to be very good: till at last, after repeated trials, I very plainly saw, that nothing dropt out of the claws, which were always dry while the spider bit; but that a short white proboscis was at the same time thrust out of the mouth, which instilled a liquor into the wound.

Then I concluded, that Mr Leeuwenhoek had delineated the apertures in these weapons, only from the analogy which he thought they must bear to the viperine fangs, the sting of the scorpion, bee, &c. And I was confirmed in this opinion by examining a claw of the great American spider, described by Piso *, and called Nhamdu; which being above fifty times bigger than that of the largest European spider, if there had been any slit in it, my glass would, no doubt, have discovered it; but yet I found it to be quite solid.

And indeed the quantity of liquor emitted by our common spiders, when they kill their prey, is visibly so great, and the wounding weapons so minute, that they could contain but a very inconsiderable portion thereof, if it were to be discharged that way.

To this purpose, I remember Mr Boyle somewhere tells a story of a person blinded by a spider dropping its venom into his eye: which, though it can hardly find credit with some, is however confirmed by what Piso relates of his Nhamdu, viz. that in catching it great heed is to be taken, lest its poison fall into the eye, this causing a total loss of the sight.

What Mr Leeuwenhoek observes of the enmity these creatures bear to one another, I have often seen: for if four, five, or more be put together into a glass, they immediately fall to fighting with all the fury imaginable. Limbs struck off are usually the preludes to the terrible slaughter, which continues till all are killed, the surviving conquerour himself most commonly dying of his wounds.

The weapons of mischief in the scolopendra or centipes, are somewhat different from those in the

* Nat. Hist. lib. v. cap. 10.

spider. Having had one of these creatures sent to me, preserved in spirit of wine, from the East Indies, (where they are very large, and their bite is so painful, that, as Bontius says *, it makes the patient almost mad), I examined the claws of its forceps by a microscope; and in each of them observed a small aperture, on the upper side near the point †. And Mr Leeuwenhoek ‡, who had one of the same kind alive, found, that, by pressing the claw, a small drop of liquor issued out of this hole.

The case is much the same with stinging animals. Of these the scorpion || is the chief, whose virus in different countries is more or less dangerous, according as it is exalted by various degrees of heat: thus in Africa particularly, its effects are so dreadful, that, as Joan. Leo † tells us, the town of Pescara there is in a manner left desolate by the inhabitants in the summer-time, by reason of the great abundance of these creatures; certain death following their sting.

Several of this kind Signor Redi † at Florence had sent to him from Tunis; and, it being November, he irritated them to sting pigeons, pullets, &c. without any bad effect at all: but upon the approaching spring, one of them, which had been kept all the winter, nay eight months, without any food, and the wound of whose sting before was harmless, stung to death two pigeons successively; but a third and fourth wounded in like manner, suffered no hurt. Yet having let the scorpion rest all night, he killed another pigeon the next morning.

* Hist. nat. et med. Ind. Or. lib. v. cap. 4. † Vid. tab. iii. fig. 1. & 2. ‡ Continuatio arcanor. natur. epist. 124.

|| Tab. iii. fig. 3. † Hist. Afric. lib. vi. † Generazion degli Insetti, pag. 15,

At the point of the sting he very often could discern a small drop of white liquor, which, when the wound was made, entered into the flesh.

As this liquid venom is either not separated from the blood into the cavity of the sting, during the cold of winter, or at least the scorpion wants strength at that time to throw it out with force and energy; so even in the hot months, after it is exhausted by two or three attacks, the sting is no longer hurtful, till the expense of this juice is recruited by time.

Viewing the sting of one of these animals brought from the East Indies, (where they are much bigger than in Africa), I could, with a glass, easily discover a long slit on each side of it, near to the cuspis, which is exactly delineated by Mr. Leeuwenhoek *, who also saw the venom drop out of it †.

It is very remarkable concerning this insect, what an ingenious gentleman, who lived several years in Barbary, told me, he had many times tried; that if it be surrounded with a circle of burning coals, it does, upon the sense of the heat, turn itself violently every way to make an escape; but finding it impossible, and the pain from the fire increasing, it strikes itself twice or thrice with the sting on the back, and immediately dies of the wounds.

The fact has since been confirmed to me by others, who have assured me, that it is a common diversion among the soldiers at Gibraltar, (where these creatures abound), to make this experiment.

This self-murder decides the controversy among writers, whether poisonous animals of the same species can kill each other. Which is not only confirm-

* Lib. citat. epist. 123. † Vid. tab. iii. fig. 4.

ed by what we before observed of the spider, but is likewise true of vipers: for Dr Herman bringing from the Indies three of the Cobras de Capello, all in one glass, two of them were killed in the voyage by fighting. And the learned Jo. Rhodius at Padua observed, that two scorpions being put into a glass, they fought, and one having killed the other, devoured it*.

As the viperine venom is the quintessence and most active part of those animal juices with which the viper is nourished; so is also that of the scorpion: for this insect lives chiefly upon locusts, &c. and the same person from Barbary informed me, that seeing oftentimes locusts sticking up in the ground, as if they were set there; by looking he found that some part of them was always ate away; and that these places were the holes of scorpions, who had dragged their prey thither, and fed on it as they had occasion.

The mechanism of the sting of a Bee Dr Hooke has very accurately described†. One may with the naked eye sometimes see it discharge the venom: and in this, by the help of a glass, I can easily discover a great number of minute salts floating.

And indeed this apparatus or contrivance is so universal, that we find even in vegetables something analogous hereunto: for the last-mentioned author‡ has shewn us, that the pricking points of nettles do, at the same time they pierce the skin, instil a venomous juice into the wound.

As the bites and stings not only of these insects we have mentioned, but also of several others, as hornets,

* Not. ad Scribon. Larg. p. 244.
observ. 34.

† Ibid. 25.

‡ Micrograph.

wasps,

wasps, gnats, &c. are often very troublesome, and attended with more pain, inflammation, and swelling, than would be expected from such little enemies; I shall conclude with observing, that the common cure, in all accidents of this kind, will be (as in the bite of a viper) by immediately sucking out with the mouth the instilled poisonous drop, and applying to the wound a poultice of bread and milk; but if this has been neglected, let the part be fomented with warm oil and soft discutient ointments.

ESSAY II.

OF THE TARANTULA.

THE symptoms from the bite of the tarantula are so very odd and surprising, that the truth of the facts has by some been called in question. There is reason for this suspicion, because the mischief commonly happens to poor people; who, as they often receive charity upon it, may be tempted to dissemble, and to act a part, as if they suffered what they really have not. And besides this, hysterical affections (as we shall observe by and by) are in this country sometimes attended with the same appearances: so that it is hard to distinguish one case from the other.

However, though there are here many deceits and impostures, yet even these, I think, are an evidence to prove the point; since it cannot be supposed, that a disease would be counterfeited, which had never any foundation in nature.

Neither can I be persuaded, that Baglivi, a native
of

of the country, and a learned physician, (who must have known that tricks were played in this way), would have taken the pains to write a long dissertation on this subject *, had he not been thoroughly convinced of the reality of such a poison.

Besides this, after Baglivi's book was published, Ludovicus Valetta, a Celestine monk of Apulia, put out at Naples a treatise upon this spider †; in which he not only answers the objections of those who deny the whole thing, but gives from his own knowledge several instances of persons who had suffered this way: some of whom were of great families, and so far from being dissemblers, that they would at any rate, to avoid shame, have concealed the misfortune which had befallen them.

To these may be added the testimony of the Honourable Mr Boyle, who assures us, that having himself had some doubts about this matter, he was, after strict inquiry, convinced that the relations in the main were true ‡.

I shall therefore, from the authentic accounts given by the two mentioned authors, extract what is most material and necessary to our present purpose.

The tarantula || is a spider of Apulia, of the octonocular kind; that is, of that species that has eight eyes, and spins webs. It has eight legs, four on each side, and in each leg three joints. From the mouth proceed two darts, in shape just like to a hooked forceps, or crab's claws: these are solid and very

* Vid. Baglivi de praxi medica, & dissertationes, Romæ, 1695.

† De phalangio Apulo opusculum, Neapoli, 1706.

‡ Of languid and unheeded motions, chap. 6.

|| Tab. iii. fig. 5.

sharp, so that they can easily pierce the skin. And between these and the forelegs there are two little horns, which I suppose answer to those bodies called, from their use in flies, the *feelers*; because as they do, so this creature is observed to move them very briskly, when it approaches to its prey.

This, as other spiders do, propagates its species by laying eggs, which are very pumerous; so that there are found sometimes in the female, when dissected, a hundred or more; and these are hatched partly by the heat of the mother, partly by that of the sun, in about twenty or thirty days time.

There is also a spider of the like nature with the tarantula in the West Indies, which Fr. Hernandez * describes by the name of *Hoitztocatl*, or the pricking spider; and says, that its bite induces madness.

In the summer-months, especially when the heats are greatest, as in the Dog-days, the tarantula creeping among the corn in the fields, bites the mowers and passengers: in the winter it lurks in holes, and is scarcely seen; and if it does bite then, it is not venomous, neither does it induce any ill symptoms.

But in the hot weather, although the pain of its bite is at first no greater than what is caused by the sting of a bee; yet the part quickly after is discoloured with a livid, black, or yellowish circle, and raised to an inflamed swelling. The patient within a few hours is seized with a violent sickness, difficulty of breathing, universal faintness, and sometimes trembling, with a weakness of the head: being asked what the ail is, he makes no reply, or with a queru-

* Hist. animal. Nov. Hispan. tract. iv. cap. 5.

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lous voice, and melancholy look, points to his breast, as if the heart was most affected.

During this mournful scene, all the usual alexipharmic and cordial medicines are of no service: for, notwithstanding their repeated use, the patient growing by degrees more melancholy, stupid, and strangely timorous, in a short time expires; unless music be called to his assistance, which alone, without the help of medicine, performs the cure.

For at the first sound of the musical instrument, although the sick lie, as it were, in an apoplectic fit, they begin by degrees to move their hands and feet; till at last they get up, and fall to dancing with wonderful vigour, at first for three or four hours: then they are put to bed, refreshed from their sweating, for a short time, and repeat the exercise with the same vehemence; perceiving no weariness or weakness from it, but professing they grow stronger and nimbler, the more they dance.

At this sport they usually spend twelve hours a-day, and it continues three or four days; by which time they are generally freed from all their symptoms, which nevertheless attack them again about the same time the next year: and if they do not take care to prevent this relapse by music, they fall into a jaundice, want of appetite, universal weakness, and such like diseases; which are every year increased, if dancing be neglected, till at last they prove incurable.

As music is the common cure, so they who are bitten, are pleased, some with one sort of it, some with another. One is raised with a pipe, another with a timbrel; one with a harp, another with a fiddle; so that the musicians make sometimes several essays, be-

fore they can accommodate their art to the venom : but this is constant and certain, notwithstanding this variety, that they all require the quickest and briskest tunes, and are never moved by a slow, dull harmony.

While the tarantati, or affected, are dancing, they lose in a manner the use of all their senses, like so many drunkards ; do many ridiculous and foolish tricks ; talk and act obscenely and rudely ; take great pleasure in playing with vine-leaves, with naked swords, red cloaths, and the like ; and on the other hand can't bear the sight of any thing black : so that if any bystander happen to appear in that colour, he must immediately withdraw, otherwise they relapse into their symptoms with as much violence as ever.

It may afford some light towards understanding the nature of this poison, to observe that Apulia is the hottest part of all Italy, lying eastward, and having all the summer long but very little rain to temper the heats : so that the inhabitants breathe in air, as it were, out of a fiery furnace. Hence their temperament is dry and adust, as appears by their being generally lean, passionate, impatient, ready to action, quick-witted, very subject to inflammatory distempers, phrensies, melancholy, and the like : upon which account there are more mad people in this, than in all the other parts of Italy. Nay, what in other countries is but a light melancholy, arises here to a great height : for women in a chlorosis suffer almost the same symptoms as persons poisoned by the tarantula do, and are cured the same way ; and in like manner the venom of the scorpion does here in its effects and cure agree very much with that of this spider.

From all this history it sufficiently appears, that those

those that are bitten by a tarantula, do thereupon become delirious. In order therefore to account for the symptoms they suffer, it may not be improper to say something concerning a delirium.

Such is the constitution of the human œconomy, that as upon the impresson of outward objects made upon the organs, and by the fluid of the nerves conveyed to the common sensory, different species are excited there, and represented to the mind; so likewise upon this representation, at the command of the mind, part of the same fluid is determined into the muscles, and, together with the arterial blood there, performs all the variety of voluntary motions and actions.

This order has been always so constant in us, that at length by a kind of natural habitude, without the intervention of the reasoning faculty, representations made to the mind immediately and necessarily produce suitable motions in the bodily organs. When therefore these representations are irregular, the actions consequent to them must necessarily be so too.

This being premised, it may perhaps be probably said, that a delirium is the representation and various composition of several species to the mind, without any order or coherence; together, at least most commonly, with irregular, or, as it were, undesigned motions of the body: that is, such a wandering and irregular motion of the nervous fluid, whereby several objects are represented to the mind, and upon this representation divers operations performed by the body; though those objects are not impressed upon the organs, nor those operations or motions deliberately commanded by the soul.

The mind indeed is the first principle of all mus-

cular motion : but in such cases as these, its promptitude to action or habit being so great, it is in a manner surpris'd, and cannot recover itself, after the spirits are with violent force determined pursuant to the representation of the species. For as, in the former state of things, a man is said to act rationally, so this latter case is called a perturbation of mind, that is, a delirium ; though it is very manifest, that in reality the defect is not in the rational, but corporeal part ; such species being really presented to the mind, upon which, by the order of our constitution, such motions ought to follow in the body.

Thus, for instance, if the liquor of the nerves is, without the presence of any thing hurtful, put into a motion like unto that which a painful impression makes in it ; the same bodily actions must ensue, as proceed from fear, anger, or the like passion, determining the spirits towards the muscular parts. And a by-stander, who sees no reason for such a representation made to the mind, will presently conclude, that the person thus acting acts without or beside his reason, that is, is delirious ; especially if the hurry and confusion of the spirits be such, that not only one, but several different species be at the same time presented to the mind : for a man in this case may act the part of one joyful, angry, timorous, or the like, without any appearing reason, and all this almost in the same moment of time.

In one word, deliria are the dreams of those who are awake. And as these in us sleeping are infinitely various and wonderfully compounded, and all from the same common cause, diversely pressing the orifices of the nerves, and thus making different repercussions
of

of their fluid ; and as we all know that, in this confusion of representations to the mind, there hereupon follow (though the body seem now in perfect repose) such motions in the organs, as are usually the effect of the arbitrary determination of the spirits thither : so we are now to inquire, what alteration of the body, made by this venom, can be the occasion of this disorder and tumult in the nervous fluid, which excites in the party infected, such surprising, and almost contradictory representations.

Most of the symptoms of those who are bitten by the tarantula, are at the first, that is, before they rise to a delirium, plainly the same with those which the bite of a viper induces : without doubt therefore, as we have before observed of the common spider, that it pierces the flesh with its hooked forceps, and at the same time instils from the proboscis in the mouth a liquid venom into the wound ; so the like claws in this * serve to make way for an active and penetrating juice emitted from the same part.

This fiery drop (as in the case of other poisonous animals) puts the nervous liquor into a ferment : a fever ensues : the secretion of this fluid in the brain, and consequently its derivation into the organs, is irregular : the impressions of outward objects upon the spirits so inflamed affect too sensibly ; nay, without the action of these, in such a disturbed state of the oeconomy, species or images are presented to the mind, which produce suitable, that is, irregular motions in the body.

More will be said to this purpose in the following essay. For the present it may suffice to observe, that

* Vid. tab. iii. fig. 5.

these representations and actions will generally be according to the temperament of the patient ; and the spirits will be hurried to those parts, to which in time of health they have been most frequently determined : and every one knows which these are in hot countries and constitutions.

It will perhaps make this theory probable, to consider that Baglivi *, in the dissection of a rabbit, killed by a tarantula, found the substance of the brain, near the origin of the nerves, lightly inflamed, with livid spots here and there ; a large quantity of extravasated serum upon the brain : the effect generally of the circulation of the blood stopped by a fault in the secretion of the nervous liquor.

As to the cure, which seems almost ridiculous, we must take notice, that the patients have no inclination to dance, till they hear the music : being desired to do it, they answer, it is impossible, they have no strength. Their starting up therefore, at the first noise of the instrument, is of a piece with their other actions : for as every thing from without has too great an effect on the nerves and their disordered fluid ; so sounds, which formerly were joined to this exercise, and encouraged it, now excite to it with fury and violence, And the benefit of it is, that the continued motions of the limbs produce large sweats, which, by carrying off the inflammatory particles, abate the fever raised in the animal spirits.

But, besides this, we may perhaps allow somewhat to the determinate force and particular modulation of the trembling percussions of the air, made by the musical chords upon the elastic fibres in the brain : for

* Page 40.

contractile bodies may be acted upon by one certain degree of motion in the ambient fluid, though a greater degree of it, differently modified, may produce nothing of the like effect. This we see in the common experiment of two musical instruments, tuned both to the same pitch: the strings of the one being struck, the correspondent strings of the other will sound; and yet a much greater motion of the air, otherwise agitated, will not cause any sensible vibration in the same chords. And also by a trick which some have, of finding the tone or note peculiarly belonging to any large wine-glass, and by adapting their voice exactly to that tone, and making it loud and lasting, they will make the vessel, first to tremble, and then burst: which it will not do, if their voice be but a little either too low or too high *.

Mr Boyle relates a story, from Scaliger, of a knight of Gascony, whom the sound of a bagpipe would unavoidably force to make water; though this secretion is regularly made by the arbitrary contraction of the muscle of the bladder †.

This makes it no difficult matter to conceive the reason, why different persons infected with this venom, require often for their cure a different kind of music: their fibres having different tensions, are not in like manner acted upon by the same vibrations.

The obstinate continuing of the patients in this exercise is, in a great measure, owing to the encouragement of the by-standers, and the strong opinion they have of being benefited by it.

* Vid. Morhofii Stentor ΥΑΛΟΚΛΑΣΤΗΣ. Kilon. 1682. † Of languid and unhegged motions, chap. 6.

Nor are we to wonder at this practice, as odd and irrational : for music was anciently very much made use of to medicinal purposes : and may without doubt do very great service, even by a mechanical force, in many bad distempers ; particularly in some disorders of the mind, which being always attended with irregular hurries of the spirits, may be quieted by exciting in them such motions as accompany the contrary passions.

It is plain from the history of King Saul, that this was known in very early days among the Jews. He being at times seized with fits of madness, was cured this way * : for the evil spirit from the Lord, I suppose, (according to the Jewish manner of expressing extraordinary incidents), means no more than a maniacal fury, which by divine judgment he at certain times fell into.

We have a famous testimony to this purpose in Galen †, who tells us, “ that Æsculapius used to recover those in whom violent motions of the mind had induced a hot temperament of body, by melody and songs.” Pindar ‡ mentions the same thing : and indeed from hence not only the notion, but the very name of charming || seems to have taken its origin.

Thus Athenæus relates, that Theophrastus in his book of enthusiasm says, “ Ischiadic pains are cured, if any one sooth (or charm) the part by Phrygian harmony †.” And in the like allusive sense Cælius

* 1 Sam. chap. 16. † De sanit. tuenda, lib. i. cap. 8.

‡ Pythior. od. 3. μαλακαῖς ἑπαιδαῖς. Vid. ibid. scholia.

|| A carmine. † Deipnosoph. lib. xiv. p. 624.

Ἰσχυιακὰς φάρμακον ἀνόςους διατελεῖν, εἰ καταυλήσῃ τις τῷ τόπῳ τῇ Φρυγιστὶ ἀρμονίᾳ.

Aurelianus calls this practice, *decantare loca dolentia*; and then adds by way of explication, that “ the pain “ is mitigated and discussed by the tremblings and “ palpitations of the part *.” Which seems very well to agree with what was before remarked, concerning the mechanical force of music upon the elastic fibres of the brain, whereby the spirits being determined to the parts affected, excite those motions in them, which produce a cure. Besides, as Athenæus here intimates, the Phrygian music was upon a pipe, which was the most vehement and brisk of all the ancients knew; so that indeed it was said to raise those who heard it, to perfect fury and madness †: and such we have observed to be requisite for the venom of the tarantula.

Aulus Gellius ‡ not only relates this same cure of ischiadic ails as a thing notorious enough; but adds besides out of Theophrastus, “ that the music of a “ pipe rightly managed healed the bites of vipers.”

And not only does Apollonius || mention the cure of distractions of the mind, epilepsies, and several other distempers this same way; but Democritus † in his treatise of plagues taught, “ that the music of “ pipes was the medicine for many diseases:” which Thales of Crete confirmed by his practice; for when sent for by the Lacedæmonians to remove from them the pestilence, he did it by the help of music +.

* Morb. chronic. lib. v. c. 1. Quæ cum saltum fumerent palpitando, discussio dolore, mitescerent.

† Vid. Bartholin. de tibiis veter. lib. i. c. 9.

‡ Noct. Atticar. lib. iv. c. 13.

|| Hist. mirabil.

+ Apud Aul. Gel. loc. citat. Plurimis hominum morbis medicinam fuisse inunctiones tibiarum.

+ Plutarc de musica.

All which instances evince this remedy to have been very ancient in many cases. And indeed, as Cælius Aurelianus * takes notice, that the first use of it was ascribed to Pythagoras himself, so he having settled and founded his sect in those very parts of Italy, which are the country of the tarantula, going then under the name of Græcia Magna, now Calabria; it is not, I think, at all improbable, that he might have been the author and inventor of this practice there, which has continued ever since: especially since Jamblichus affirms †, not only that he made use of music in physic, but particularly that he found out and contrived some harmonies to ease the passions of the mind, and others for the cure of bites.

To this useful power of music I will (to confirm my reasonings upon it) add a remarkable instance of its hurtful effects, even in a brute; which an ingenious gentleman told me he once saw. A player on a fiddle having frequently observed, that a dog in the room was always so affected by a particular note, as to howl, and shew great uneasiness at it; one day, for experiment's sake, continued to strike the same note so long, till the sensible animal fell into convulsions and died.

To conclude with the tarantula, we may take notice, that, as to the return of the symptoms the next year, that is owing to the same excessive heat in those months, acting again upon the small remains of the venomous ferment. Thus Bartholin ‡ relates a story of a melancholy physician at Venice, who suffered the

* Loc. ante cit.
πρὸς δηγμὸς βοηθητικῶτατα μέλη.
cent. 2. H. 16.

† De vit. Pythagor. cap. 25.
‡ Histor. anatom.

attacks of his disease only during the Dog-days, which yearly ended and returned with them : a convincing proof how great a share heat has in all these cases.

E S S A Y III.

OF THE MAD DOG.

THE terrible effects of the poison from the bite of a mad dog, appear after so different a manner in different subjects, that the accounts given of them by authors, being generally taken from single cases, are very different, and hardly consistent with one another. The main symptom indeed they all agree in, is what they call (though improperly) the *hydrophobia*, or dread of water : but the disorders with which this is attended, are related so variously, that they can scarcely be thought to belong to the same kind of malady.

I shall therefore first describe the history of this disease, from observations made on a considerable number of patients ; and then inquire into the reasons, why the fatal distemper commonly produced by it shews itself with so much variety, and appears, as it were, disguised in some cases.

The wound from the bite of a mad dog differs not at all from that made by a common bite, and is as easily healed : and it is usually a considerable time before any bad consequences of it appear. There are instances where these have been deferred to three, four, or six months ; nay, some authors say, to a year and longer. Galen himself saw one case after a
year ;

year *; I remember one after a eleven months; but the attack is generally within thirty or forty days, though very often sooner, sometimes in fifteen or sixteen days, in young subjects.

The first approaches of the distemper generally discover themselves after this manner. A pain is felt in the part which was wounded, which by degrees spreads itself to the neighbouring parts: a lassitude follows with uneasiness in all the limbs. Then the patient grows pensive and sad, with disturbed and unquiet sleeps, complains of faintness and lowness of spirits, particularly of an oppression at his breast. His pulse intermits, his nerves tremble, he has cold sweats, a great nausea and sickness at stomach, and loaths food: and though he has an inward heat and thirst, and desires to drink; yet he swallows meat, but especially liquors, with great difficulty. These symptoms increase; and the next day, from the great uneasiness and pain which he finds in swallowing, he conceives such an aversion to liquids, that at the first sight of them he falls into convulsions and agonies, and cannot get down the least drop. This hydrophobia has always been accounted the surest sign and mark of this poison, by which it is distinguished from all other diseases; as not being observed, at least very rarely, in any other case whatsoever.

At this time a fever usually appears, with a quick but low pulse, without the least sleep, a hoarse voice, a gathering of froth in the mouth, and spitting out of this upon the by-standers; universal convulsions, particularly about the throat, and in the muscoli erectors penis, whence a continued priapism is observed.

* Comment. ii. in 1 Prorrhēt. Hippocrat.

During

During this tragical scene, which always proves fatal in about two days, a delirium comes on, sometimes with most terrible symptoms of rage and fury, and attempts of doing all possible mischief even to the most beloved friends and relations; but more commonly without any furor, it is of the melancholy kind, and the wretch resigns to death, and prepares for it, bids those about him take care of themselves, lest he should do them a mischief; and begs that they would trouble him no more: and, his breath growing shorter and shorter, he expires in convulsive fits.

Many of the ancients have mentioned this disease, particularly Dioscorides, Galen, Ætius, Ægineta; but none have described it so largely as Cælius Aurelianus*, who, from the writings of the Greek physicians, (chiefly Soranus, of the Methodic sect), has collected, and put into obscure bad Latin, all the symptoms of it, with great pains and exactness. The names of the more modern authors on this subject may be seen collected by that diligent observer, Stalpart Vander Wiel†, to which may be added the learned Dr Lister‡.

It will afford great light towards the knowledge of the nature of this abstruse disease, to remark some odd appearances in the progress of it; which, though with a little variety, discover themselves in a greater or lesser degree in all the unhappy patients.

It is common to them all, that they can ill bear the impression of objects upon the senses. All feeling is painful. The slightest touch or rubbing of the limbs hurts. The least noise is offensive: and the

* De morbis acutis, lib. iii.
cent. i. obs. 100.

† Observat. rarior.
‡ Exercit. medicinal.

opening or shutting of a door affrights, as if the house was falling. The eyes so ill bear the light, that even the sight of any thing white is intolerable. In like manner, the inward membranes are so tender, that they cannot suffer their natural sensation. The common coolness of fresh air is disagreeable to the lungs : and the making of water gives uneasiness and grief in the urinary passages. The aspect is dismal, either frightful with tokens of rage and fury, or lamentable with marks of moaning and despair. There is no sleep from the beginning of the fever to the end.

When the symptoms are maniacal, the strength of the muscles is prodigious ; these acting indeed with a convulsive force so great, that I have seen a case, in which a man tied down in bed with strong cords broke them all at once by one effort, and immediately died paralytic ; as if all the fibres of the body had been overstrained, and torn to pieces by their violent action.

As to the hydrophobia, the patient at first has no dread of water, nor any aversion to liquors. On the contrary, he sees them with pleasure : being thirsty he desires drink ; but then soon wonders, what should be the reason, that he is not able to take it. He contrives ways to do it, by endeavouring to suck through a quill, &c. but soon cries out, It is impossible. When asked why, he answers, It will not go down, it strangles him, and begs to be excused trying any more.

In order to find out the cause of this train of dreadful events, we must take notice, that the rabies or madness in a dog is the effect of a violent fever ; and therefore it is most common in excessive hot weather, though sometimes intense cold may be the cause
of

of it : that no dog ever sweats ; from whence it follows, that when his blood is in a ferment, it cannot, as in other creatures, discharge itself upon the surface of the body ; and therefore must of necessity throw out a great many saline and active particles upon those parts where there is the most constant and easy secretion : and such, next to the miliary in the skin in us, are the salival glands. For this reason much more spittle is separated in a dog, when mad, than at any other time, and that very frothy, or impregnated with hot subtile parts.

The looks of a dog in this condition discover a fever.— He runs wildly forward panting, snaps at every one he meets ; his tongue hangs out of his mouth with flabber ; his eyes are heavy, full of tears ; he takes no food nor drink. In dissecting one who died mad, the forepart of the dura mater on the brain, about an inch above the eyebrows, was found inflamed, and even ulcerated, the ulcerations piercing through this membrané, and also the pia mater : and upon pressure there issued out from the small ulcers a thin matter tinged with blood.

Now, as we every day observe, that what is thrown out from liquors in a ferment, is capable of inducing the like motion in another liquor of the same kind, when duly mixed with it ; so we may very well suppose in the present case, that the saliva, which is itself one of the most fermentative juices in nature, being turgid with fiery saline particles thrown into it out of the boiling blood, when it comes by means of a wound to be mixed with the nervous liquor in another animal, must necessarily put it into violent agitations, in the nature of a ferment, (as has been ex-

plained in the introduction) : the consequence of which will be, all the effects of an interrupted secretion in the brain, and disturbed circulation of the blood, a fever with a delirium, convulsions, &c.

That this delirium is sometimes maniacal, sometimes melancholic, is owing to the different temperament and constitution of the patient, inclined more to passions of one kind or the other. As we see the effects of drunkenness are in one man good humour, mirth, and joy ; in another, ill-nature, malice, and rage ; in a third, a mixture of ridiculous and extravagant actions ; and all from the same common cause, raising natural dispositions to a higher pitch. And we must likewise observe, that the huntsmen distinguish in dogs themselves two kinds of this disease, one of which they call the biting, the other the sullen madness.

In short, this distemper is a fever of that kind, in which the nervous fluid is more particularly affected, from the violent action of an extraneous fiery matter mixed with it. A delirium ensues, attended, according to the disposition of the body, with symptoms either of fury or of despondency, and very often with a mixture of both. For we know that these are frequently changed, and succeed to each other : a mania being indeed usually a heightened melancholy ; that is, from great and continued lowness of spirits, apprehensions of evil increase more and more, and the imagination is possessed with species of things most terrible and destructive : upon which the mind is necessarily determined to actions, which by the constant order of nature follow upon such representations. And we therefore find, that, even in common

mon fevers, patients will sometimes give warning of their growing furious; that is, of their perception of frightful images, which will of course unavoidably hurry the mind to outrageous efforts.

But the hydrophobia (though it is commonly thought to be so) is no part of this delirium; as will appear anon.

From the description we have given, it may, I think, be concluded, that there is in all these cases some degree of inflammation, with too great a tension and driness of the nervous membranes, and too much elasticity and force in the fluid with which they are filled: that by this they have acquired a preternatural sensibility; so that the usual impressions of outward objects, instead of an agreeable feeling, give pain and uneasiness; and inward images are so strong and lively, that the mind is surpris'd, and determines the spirits into the muscular organs with an irregular impetus.

As a proof of this, the dissection of the dead bodies generally discover the vessels in the brain distended; the sinus longitudinalis full of fluid blood, not coagulated, as is usual in most other diseases of the head; the brain itself, and the spinal marrow, drier than ordinary; the pericardium without liquor; the lungs loaded; the arteries full of blood, very fluid, and hardly concrescible in the open air: appearances all, which shew the animal spirits to have been principally affected.

The hydrophobia, we said, is no part of the delirium. For the patients, being feverish and thirsty, do always desire drink, as long as they can swallow it: at last they find they can neither eat nor drink, but

drinking is the most difficult. Now, the reason is this. This fever is of the nervous or spasmodic kind: all the nerves are drawn into cramps; particularly the muscles employed in deglutition are convulsed, their action is lost, and it is then impossible to get any thing down. To ask one in this condition to drink, is to desire him to choke himself; and when he has found this to be so, he dreads the sight of liquors offered to him, as much as he would a knife presented to his throat, and strives to keep them from his mouth. Liquids in such a state are swallowed with more difficulty than solids; because the instruments of deglutition (which are principally the back part of the tongue, the hinder part of the palate, and the upper part of the œsophagus) can more effectually embrace and act with their joint force upon solid, than upon liquid substances. And besides this, the epiglottis (which must always be closely shut at this time) is more powerfully pressed down by a solid, than by a liquid body. When therefore the united force of these parts is taken away by convulsions, some part of the liquids will slide down into the aspera arteria: upon which a suffocation must immediately follow. This disease therefore should have been called *Δυσκατάποσις*, a difficulty in swallowing; rather than *Ὑδροφοβία*, a dread of water.

It will serve both to illustrate and confirm this reasoning, to take notice, that there are other distempers besides this, (and all indeed of the nervous kind), in which the same frightful symptom is sometimes observed. Authors * have remarked it in malignant fe-

* Schenkii de venen. animal. Salmuth. observ. cent. ii. obs. 52.

vers ; and a common melancholy has been seen to end fatally in it *. I have known it, in the height of a violent hysteric disorder, to have continued for many hours, till the convulsive motions in the throat were quieted by proper medicines : and I remember a case, in which fits of a palpitation of the heart were attended with so great a degree of it, that it seemed not to differ from the true hydrophobia.

On the other hand, it has sometimes happened, that this bite has been followed with all the other usual symptoms, even to a fatal degree, and yet no hydrophobia has appeared. A learned physician has assured me, that in Shropshire he saw three patients in one year, who, at the ordinary time of about thirty or forty days after the wound, all fell into such nervous disorders as have been described, a fever, delirium, oppression of the breath, palpitation of the heart, spasms, &c. and died on the third day : yet none of them, during this melancholy scene, had any difficulty of swallowing, or shewed any signs of a dread of liquids.

The hydrophobia therefore is only a local convulsion, which, when the universal feverish affection of the nervous system is come to the height, is very seldom absent : but though it be, the spasms of all the other parts may prove mortal. And because this fever of the spirits is rarely so violent in any cases, except the bite of a mad dog, as to produce a difficulty of swallowing ; this symptom has been thought to be peculiar to that poison.

Nothing seems more wonderful in this whole affair, than that the venom should as it were lie latent in

* Ephemer. German. ann. 1687.

the body so long a time before it discovers itself. Now, if, as has been said, the poisonous saliva acts upon the nervous fluid in the manner of a ferment, it may well be conceived, that before this can have a sensible effect, it must make some alteration in the more solid fibres of the brain, by inducing perhaps that tension and driness of the membranes, which we have mentioned. This in different constitutions will be done in a different space of time : nay it may so happen, that this ferment being weak, and the constitution strong, no visible mischief may ensue, till some accidental alteration in the body unluckily gives it an additional force ; as we observed in the case of the tarantula, how far external heat promotes the delirium.

And therefore, by parity of reason, the calamitous symptoms may sometimes, by the concurrence of extraordinary circumstances, be unexpectedly brought on in less time than any above mentioned.

We experience every day in common nervous distempers, that the return and violence of the fits depend very much upon the action of things both within and without. We may add to this, that in some diseases, in which the blood itself is infected, and the solid parts, even the bones, corrupted, the poison seems to be hid a considerable time, while it is working in the body, before its last effect appears ; as particularly in venereal cases.

Neither will it seem strange, that a poison so different in its force, and so alterable by many circumstances, should in some subjects produce symptoms of the same convulsive kind, yet not to such a degree as to hinder deglutition ; and these too only at particular times.

A soldier of a strong habit of body came to me not long since, who once a-month was seized with a great anxiety, palpitation of the heart, and difficulty of breathing. He had been bitten by a mad dog about six weeks before he began to complain. By bleeding, cold bathing, the powder of lichen with pepper, and volatile medicines during the oppression, the fits were every month less violent, and at last quite left him.

A most remarkable case of this kind was communicated to me by a person of unquestioned veracity. It was this. A gentlewoman in Yorkshire, of the age of thirty-five years, was bit by a mad dog in the fore finger: about a month after, she had a pain in that part, which shot up to the shoulder, and was thought to be rheumatic. This pain returned every month, just a day before the full moon, lasting generally three days. After fifteen months she fell into the hydrophobia, and died the third day. Her friends then recollected the bite to have happened so long before.

The influence of the moon in these cases I am convinced is of some weight. The manner of its action I have attempted to explain in another place*: and as the proofs there given are undeniable, and very much regard the nervous fluid; it cannot be doubted, but the same power may have the like effect in a disease in which this fluid suffers more remarkably perhaps than in any other whatsoever.

Looking over the histories of the many patients I have attended in this deplorable condition, I observe about one half of the number to have been

* *De imperio solis ac lunæ.*

attacked

attacked with the spasms preceding the hydrophobia, either upon the full moon, or the day before it. And where this is only an influence concurring with inward causes of great force, it is not to be expected, but that those should often prevail without this external assistance.

But it is time to come to the cure, or rather the means of preventing the effects of this terrible poison. For all authors agree, that, after the appearance of the hydrophobia, the case is almost desperate: and the reason is plain from the description we have given of it, a dismal scene of the last struggles and agonies of nature yielding up to the enemy.

The first care to be taken is of the wounded part. The ancient physicians *, who are followed in this by the moderns †, advise, where the place will admit of it, to enlarge the wound by incision; to apply a cupping-glass; to burn it with a hot iron; and to keep a discharge from the ulcer by drawing medicines for many days.

I cannot but say that I think all this severity needless. The design of it is to draw out the poison: but as it has been proved, that this immediately affects the nervous liquor, the mischief must have taken place, before applications of this kind can be made.

I therefore am of opinion, (because it may however be of some service to have a continued drain from the part), that it will be sufficient to enlarge the wound a little, and dress it with ung. basilic. nig. adding to it a small quantity of mercur. præcip. rub. as a digestive.

* Vid. Galen. de ther. ad Pis. l. i. c. 16. & Ætium, l. vi. c. 24. & Celsus, l. v. c. 27. † Hildan. obs. cent. i. obs. 87.

It happens in most cases, that the wound being small, is healed up before the patient seeks for help. For this reason, and because it is of no great consequence whether it be cured or not, in the paper which I printed and dispersed some years since, entitled, *A certain cure for the bite of a mad dog*, I took no notice of any outward application: the rather, because I thought, if any great stress was laid upon it, it might frighten those who had neglected this care, and lead them to think that the other part of the cure would not be effectual without it. And I can safely affirm, that (whether any outward application was made or not) I have never known this method to fail of success, where it has been followed before the hydrophobia began: although, in the course of about thirty years, (besides the experience made by others, both in town and country), I have used it a thousand times. I have often wished that I knew so certain a remedy in any other disease: I shall therefore give the reasons of this method.

But before I proceed to the particulars of it, it may not be amiss to mention the most considerable medicines which have been formerly used in this case: for it will hence appear, that the like intentions have been pursued in all times, though by different ways.

The injudicious jumbles of theriaca's, specific antidotes, &c. whether old or new, deserve no notice. That ridiculous preservative, the liver of the mad dog, which Pliny says * should be eaten rather raw than boiled, is neither good food nor physick. Galen † observed, that it availed nothing: and I remem-

* Hist. nat. l. xxix. c. 5. † De simpl. med. facult. l. ii. c. i.

ber to have seen a poor boy die mad, who had greedily devoured almost the whole of it.

There are two or three remedies recommended, I think, upon rational grounds. The first is the cineres cancrorum fluviatilium, ashes of the river crawfish. These were prepared by burning the fish alive upon a copper-plate, with a fire made of the cuttings of twigs of the white briony. This Galen * avers that nobody ever made use of without success: and before him Dioscorides † assured, that it is a medicine which might be relied on. This calcined powder was given in large quantities, viz. a good spoonful or two every day for forty days together; either alone, or rather mixed with a small portion of gentian root and frankincense.

Another medicine is the spongia cynorrhodi, vel rosæ sylvestris, the sponge of the dog-rose, which is so celebrated an antidote against this and other animal poisons, that P. Boccone ‡, who has written a whole discourse upon its virtues, tells us, it is called in Sicily, *sanatodos*, or all-heal.

Besides these, the plant alyssum, or madwort, had its name given it by the ancients, from its great efficacy against this madness. This was of two sorts; one described by Dioscorides, a species of the leucium; the other by Galen, a marrubium ||. To these may be added, garlic, agrimony, and oxylapathum.

Now, it is remarkable, that all these remedies are powerful diuretics; the two first of the animal, the

* De simpl. med. facult. l. iii. c. 34. † De theriac. c. 2. ‡ Museo di piante rare, obs. 2. || Vid. Fab. Column. Phytobalan. p. 27.

last of the vegetable kind. For, as Mr Ray * has observed, the sponge of the cynorrhodon is an excrecence formed upon the plant, as galls are upon the oak. If it be cut, it is found full of white worms, being the nest of these insects; which lodging here all the winter, do in the beginning of the spring turn to flies, and quit their quarters.

All insects abound with a diuretic salt; but as cantharides do so more than any others, therefore the learned Baccius † goes farther, and, from the authority of Rhazes and Joannes Damascenus, advises to give these in substance for many days together. The preparation of this antidote (so he calls it) is by infusing the flies in sour butter-milk twenty-four hours, then drying them, and with the flour of lentils and wine making them up into troches of a scruple weight, of which one is to be taken every day; by which means he assures us, that though the patient make bloody urine, yet that milk largely drank will abate that symptom, and that the hydrophobia will be happily prevented. Boccone likewise informs us, that in Upper Hungary they give in this case five cantharides in one dose to men, and to beasts a greater quantity ‡.

I must add, that Ætius ||, who has collected all the medicines he could from the old physicians, affirms, that himself knew an old man, who cured those who were bit, with common sorrel only. He washed the wound with a decoction of this herb, and laid it on as a cataplasm, and gave it in drink: by

* Hist. plant. tom. ii. p. 1471. † De venen. p. 89.

‡ Museo de fisica, observ. 21. || Lib. vi. c. 24.

this means, the patient made a great quantity of turbid urine.

From hence it appears, that the surest remedies in all ages against this venom have been such as provoke a great discharge by urine. Reflecting upon this, I thought it must be right to give to the public a course easily to be pursued, which by preventing the fever for a long time after the bite, and constantly promoting this evacuation, might secure the patient from danger. The method is this.

“ Let the patient be bled at the arm nine or
 “ ten ounces. Take of the herb, called in Latin,
 “ *lichen cinereus terrestris*, in English, *ash-coloured*
 “ *ground liverwort*, cleaned, dried, and powdered,
 “ half an ounce. Of black pepper powdered, two
 “ drachms. Mix these well together, and divide
 “ the powder into four doses; one of which must be
 “ taken every morning, fasting, for four mornings
 “ successively, in half a pint of cow’s milk warm.
 “ After these four doses are taken, the patient must
 “ go into the cold bath, or a cold spring, or river,
 “ every morning fasting, for a month: he must be
 “ dipt all over, but not stay in (with his head above
 “ water) longer than half a minute, if the water be
 “ very cold. After this he must go in three times
 “ a-week for a fortnight longer.”

This powder was first published in the Philosophical Transactions *, from Mr Dampier, in whose family it had been kept as a secret many years: and, in the year 1721, it was, at my desire, put into the Pharmacop. Lond. by the name of *pulvis antihyssus*. I afterwards made this alteration only, of putting two

* N^o 237.

parts of lichen to one of pepper, instead of equal parts, because I thought it too hot : and whereas but two or three doses of it were formerly given, I repeated it four days.

The lichen, like those already mentioned, is a warm diuretic ; the pepper is added, I suppose, to make it more agreeable to the stomach : for it is distasteful and nauseous.

This plant * is so remarkable for its virtue, that it may not be amiss to give a description of it.

Mr Ray, so far as I can find, was the first who gave a distinct account of it †, reckoning it among the lichens. Our great botanist, Dr Dillenius, has lately more exactly described it ‡, and put it into the tribe of the mosses, calling it *lichenoides digitatum cinereum, lactuca foliis sinuosis*. It appears indeed to be of a substance between a fungous and a muscus, soft, spongy, and lanuginous. It grows close to the ground, chiefly on heaths, and in woody, shady places, near the roots and stumps of trees ; which being commonly covered with creeping, mossy herbs, it sticks to them when it is gathered.

It is found in all countries, and from America has been observed to be brought over with the Peruvian bark.

The leaves when young are small, but grow to two or three inches in length, and an inch or two in breadth, divided into several segments. They are sometimes single, sometimes lying upon one another. At their extremities they produce little hard, oblong bodies, which the botanists call *pelta*, and are un-

* Vid. tab. iv.
1670, & hist. plant.

† Vid. Catal. plant. Angl. ann.
‡ Hist. muscorum, p. 200.

doubtedly the seminal capsulæ. The leaves, when dry, are ash-coloured, darker on the upper part; on the under, lighter. Frequent veins are observed along them, from which here and there run small white fibres into the earth, the roots of the plant.

It is found at all times of the year, especially after rainy seasons, that is, from autumn to winter: and therefore, as being in its freshest vigour, it should always be gathered about that time.

I have also examined it by distillation; by which four ounces of it yielded, of an acid water, one ounce, five drachms, one scruple, and two grains; of oil heavier than water, two drachms, one scruple, sixteen grains; of coal containing fixed salt, one ounce, two drachms, one scruple, eleven grains.

But I proceed in the cure. To make this more effectual, I added the use of cold bathing, which had never been recommended in this manner before. The ancients, as I shall observe presently, never applied it till the hydrophobia appeared: and the common practice among us of sending the patient to the nearest salt water, as soon as may be, and there only to dip him all over twice or thrice, it is plain, cannot avail much to the prevention of a disease, which will not appear till about a month after; and therefore it ought to be continued for so long a time, if any advantage is to be expected from it: and I have indeed known many to have died raving, who had undergone this treatment. It is the pressure of the water upon the surface of the body, and the constriction the cold makes upon the fibres of the skin and the small tubes, which produce the good effect. The distension of the vessels by the fermenting humours is hereby

by repressed, and a flux of urine promoted for so many days, that all danger of the nervous fever, the consequent of the instilled poison, is quite over. And if it should be thought that salt water, being heavier than fresh, will press more; this difference, in two or three immersions only, can be but of small moment, and is abundantly compensated by the greater coldness of springs (which are usually chosen for this purpose) than is felt in the sea.

Thus I have made plunging into water effectual in preventing this disease, without the danger of drowning: whereas the ancients practised the same to remove it when it appeared, with some degree at least of this hazard. For Celsus *, who seems first to have mentioned it, and says it is the only remedy, advises, if the patient cannot swim, to let him be kept under water, that he may swallow it; and then at times be lifted out of it; if he can swim, to hold him under by force, that he may drink whether he will or not. This in short is drowning and recovering by turns. And I make no question, but so bold a practice was grounded on the authority of the Greek physicians, from whose rich stores this Latin author has extracted, and digested into a small compass, the best system that ever was composed of medicine.

However it be, the famous Van Helmont †, in the

* *Unicum remedium est, nec opinantem in piscinam non ante ei provisam projicere, et, si natandi scientiam non habet, modo mersum bibere pati, modo attollere; si habet, interdum deprimere, ut invitus quoque aqua satietur: sic enim simul et sitis, et aquæ metus tollitur.* Lib. v. cap. 27.

† *Ortus medicin. demens idea.*

beginning of the last century, having observed the great effects of this practice in Flanders, recommended it in a very strong manner. He saw an old man in the hydrophobia, cured by submersion in salt water. He was first held under the water about four minutes, then taken out, and dipped again twice more, each time about a minute. When he was taken out, he really thought him quite dead; but being kept warm, and laid over a barrel, he vomited up the water he had swallowed, and recovered both his life and right senses.

He relates another remarkable story of the cure of the common mania, by being drowned in fresh water; and from this rightly concludes, that it makes no difference in the case, whether the water be salt or fresh. He justly remarks, that great care should be taken not to give over for dead those who are drowned; adding two remarkable instances of persons who were brought to life, after they had lain under water half an hour. And to this purpose I remember, that an ingenious physician told me, that he had, not long since, in the country, happened to save a man from the grave, who having been sunk in a river more than twenty minutes, was judged to be past all hopes of recovery.

There are many accounts upon record of those, who after having been drowned many hours have been brought to life*. This should certainly encourage the use of all means upon such accidents, especially since the trial is not difficult. The first step should be, to blow up the smoke of tobacco into the inte-

* Vid. dissertation sur l'incertitude des signes de la mort. Paris, 1742.

tines : then to warm the body shaking and rolling it about, and rubbing it with warm cloaths in bed : in a word, to put the blood into motion by all manner of ways ; and not to be discouraged, though no signs of life should be discovered after an hour or two spent in this good work : towards the latter end of which volatile spirits and salts may have a good effect. Neither should bleeding be omitted, when the blood is become warm enough to drop out of the veins.

But to return from this (I think useful) digression to the hydrophobia, I must observe, that if submersion in this way be put in practice, it ought to be done upon the very first signs of the symptom, before the fever is come to its height. For when it is so, there will not be natural strength to overcome the shock : and I have always found, that at this time even common bathing has proved hurtful.

But experiments of this kind are perhaps rather to be permitted than enjoined by physicians, for their own sakes ; though it is certain, that cures more dangerous than this are every day directed : but that is generally in cases, where it cannot so evidently be known, whether the patient dies by the remedy or by the disease. In such kind of attempts, the danger from the trial is to be weighed against that from the disease : if this outweighs, it is not only reasonable but merciful, “ even with a kind of rashness,” as Celsus some where expresses it, “ to snatch an opportunity of doing good *.”

At least there is more humanity in such proceed-

* Cum quadam temeritate medicamenta arripere oportet.

ing,

ing, than in stifling a miserable wretch between two feather-beds : which, as I have been informed, is the practice in a neighbouring country, and sometimes in our own.

But the greatest comfort is, that at any time before this scene of horror opens, simple immersion without drowning will prove effectual. For though it is best to begin the method prescribed, as soon after the accident as it can be done ; yet where it has been neglected, even till a day or two before the calamity might be expected, (as was judged from the beginning anxiety and oppression of the spirits), the success has been the same.

Before I quit this subject, I must take notice, (as I have hinted from Van Helmont), that this action of cold water upon the body, by pressure and constriction, makes it of singular service in the cure not only of acute, but also of chronical deliria. Dr Willis * relates a very remarkable story of a lusty young woman, who, having been raving mad seven or eight days, was by his order carried abroad at midnight, and thrown naked into a river, where she swam about without help for more than a quarter of an hour ; and taken out was put to bed, fell into a sleep and large sweats, and recovered without the help of any other remedy.

But there is no need of instances of this kind. Our physicians, who are most conversant in the cure of these maladies, find by daily experience, that this practice has a very considerable share not only in re-

* De anima brutorum, part. patholog. cap. x. de delirio et phrenitide.

covering their patients, but also in preventing a relapse into the same misery.

I am therefore sorry to read in the Philosophical Transactions*, a remark of a learned gentleman, who, upon my recommending cold bathing, proposes rather the use of the hot bath: because "a cold bath," he says, "shuts the pores, as a warm one opens them." Surely he should have known, that the shutting of the pores by a short cold immersion, is naturally followed by a glowing warmth, which relaxes and opens them; and by this means promotes perspiration, without the distension of the vessels by an inflammatory heat. I am afraid no bathing, whether hot or cold, would clear a head possessed with such immechanical notions.

To say no more, whoever has rightly considered the Bellinian theory of melancholy and maniacal distempers †, will easily see the reason of the surprising effects of this safe and easy application, in dispelling the greatest calamity to which mankind is liable.

As to all other ways of curing the hydrophobia, I own I have not been so happy as to find any success from the many I have tried. Bathing, at this time, is ineffectual. I have taken away large quantities of blood; have given opiates every three or four hours; tried volatile salts, assa foetida, the rad. valerian. sylv. with other antiepileptics, in large doses; as also the famous Indian remedy, musk and cinnabar; laid on blistering plasters; cooled with nitre and emulsions of barley-water, &c. All has been in vain, because too late. And what is still more discouraging is, that though sometimes I have conquered the terrible

* No 443.

† Vid. Bellin. de morbis capitis.

symptom,

symptom, and brought the patient to drink freely ; yet he has died in twenty-four hours with a fever and convulsions : a plain proof of what we have said of the manner in which this poison operates.

However, nothing is to be omitted to the last, be the prospect never so bad ; because that may succeed in one patient, which has not in a hundred. I have by me a letter from the learned Dr Boerhaave, in which, with his usual exactness and judgment, he relates two cases of the hydrophobia. In the first, according to the method mentioned in the history of the royal academy at Paris *, he ordered buckets of cold water to be poured, for a considerable time, upon the patient's head ; and a clyster, of warm water, oxymel simplex, and sea-salt, to be injected every four hours. By these means he was brought to drink freely of small beer, and a decoction of marsh-mallow leaves, elder-flowers, and tamarinds : but, notwithstanding these hopes, he died convulsed, yet calm and in his senses, in a few hours.

The other case had a more happy event : for though the dread of liquids was attended with foaming, roaring, and the most mischievous rage ; yet by large doses of nitre, (to which laudanum and diacodium were sometimes added) ; by cooling the head continually with vinegar and rose-water ; bathing the feet for one hour, every night and morning, in warm water and vinegar, with salt ; keeping the body open by tamarinds, syrup of violets, and frequent clysters of water and nitre ; and lastly, eating almost constantly lemons with a little sugar ; the poor wretch was most perfectly recovered.

* Ann. 1699. pag. 49.

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But I must here observe, that the use of all these things was entered upon four days before the dread of water began; by which means the violence of the disease was, without doubt, very much abated: and I have great reason to believe, from what I have experienced, (as I have already said), that the method I have recommended, would at that time even have prevented the calamity.

To conclude, if any relief could be expected in this desperate state, I think it would be from large bleeding, even *ad animi deliquium*, before the fibres of the membranes and vessels have lost their natural force by convulsions; nitrous medicines; and plentiful diluting with cooling subacid liquors. But after all, it will generally happen, that (as the Greeks said upon deplorable cases) "death will be the physician that cures *."

E S S A Y IV.

OF POISONOUS MINERALS AND PLANTS.

Though there be a great variety of internal poisons, as well mineral as vegetable, yet they all manifestly agree in their primary effects and manner of operation; which (as is explained in the introduction) are somewhat analogous to the mischief from venomous bites or stings: the main difference lying in this, that in the one wounds are made outwardly, in the other inwardly, that is, in the stomach and

* ἰατρὸς ἰάται θάνατος.

bowels;

bowels; but in both cases, the animal œconomy suffers in much the same way.

“Poisonous medicines,” says Dioscorides, “are many; but the alterations made by them in the body common, and but few*.”

Of all this kind, those of a mineral nature are the most violent and deadly, the greater gravity and scolidity of their parts giving to these a force and action surpassing the mischief of vegetable juices. And therefore, whereas noxious plants vary their effects in different creatures, so as to prove harmless, nay perhaps beneficial and nutritive to some, as we have before observed †; the strength of the stomach in these animals being sufficient to conquer and divide such corrosive substances, and their blood perhaps requiring to be recruited by such warm and active particles; a mineral malignity is not, at least so far as we know, conquerable by any, but becomes universally hurtful and destructive.

We shall here give the first place to mercury sublimate.

This is nothing but a mixture of quicksilver with common salt. For, though it is always prepared with nitre and vitriol added to the salt, in different ways, the best of which is that described by Tachenius †; yet neither of these enter into the composition, serving only to facilitate the work, (which they do by uniting with the alkaline parts of the salt, and thus freeing its acid from them); as abundantly appears

* Ποικίλα μὲν γὰρ τὰ δηλητήρια φάρμακα, κοινὰ δὲ καὶ ὁποῖαι αἱ ἐξ αὐτῶν γινόμεναι διαθίσεις. Alexiph. p. 399.

† See the introduction.

‡ Hippocrates chymic.

cap. 24.

from this experiment, that mercury sublimed with the same proportion of nitre and vitriol, without salt, neither receives any increase of its weight, nor acquires any malignant quality.

The effects of this poison, when taken, are violent griping pains, with a distension of the belly; vomiting of a slimy, frothy matter, sometimes mixed with blood, and stools of the same; an intolerable heat and thirst, with cold sweats, tremblings, convulsions, &c. as will appear from the following history*.

To a large dog was given a drachm of mercury sublimed, mixed with a little bread. Within a quarter of an hour he fell into terrible vomitings, casting up frequently a viscid, frothy mucus, every time more and more bloody, and purged the same downward: till tired and spent with this hard service, he lay down quietly as it were to sleep, but died the next morning.

The abdomen being opened, a great quantity of extravasated blood was found between the liver and stomach, and between the duplicature of the omentum about the stomach; the guts as well as the stomach were distended, and full of a frothy bloody mucus: on the outside they were of a livid colour, within all over red, and inflamed down to the very rectum. The fibrous coat of the stomach being taken off, between that and the nervous one, grumous blood was found in several places: the like was discovered here and there in the intestines between the same coats.

The same symptoms with these, and manifest signs of a burning corrosion, followed with ulcers in the

* Wepfer de cicut. aquatic. pag. 300.

bowels, Baccius * observed in a young man poisoned by sublimite, mixed with his meat.

What we are here chiefly to examine, is, how, from ingredients singly innocent and harmless, so mischievous a compound can result : for as the case is very plain with respect to salt, so is it likewise now notorious enough, that quicksilver itself, which the ancients, Dioscorides, Galen, Pliny, &c. have unjustly ranked among poisons, is in many diseases, inwardly taken, of very safe and beneficial use ; and that not only when disguised with sulphur, sugar, &c. but crude, without any correction, or vainly pretended mortification.

This the Arabian physicians first gave the hint of : Avicen † having observed, that “ they who drink “ it in a large quantity, receive no hurt ; its weight “ making a free passage through the body.” This was encouragement enough for the practice of giving whole pounds of it in the iliac passion ; which is oftentimes done with good success, without any frightful symptom accompanying the advantage received from its ponderosity.

Afterwards it plainly appeared, that this mineral, either applied outwardly, or taken inwardly, though not in so great a dose as could immediately force its way through the intestines, even when it was lodged for some time in this or that part, was not at all hurtful by any corrosive or malignant quality.

I remember, that I once found some quantity of it in the perinæum of a subject taken from the gallows

* De venen. pag. 21.

† Can. Medic. l. iv. fen. 6. Argentum vivum plurimum qui bibunt, non læduntur eo : egreditur enim cum dispositione sua per inferiorem regionem.

for a dissection, (whose rotten bones discovered what disease had required the use of it, and that, I suppose, by unctiō), without any marks of corrosion of the part where it was collected.

And Fallopius *, Brasavolus †, with others of great note, confirmed its harmless efficacy in the cure of the worms, not only in adult persons, but even in the more tender constitutions of children.

Nor are these the only cases in which good service may be had from this weighty fluid. He that rightly considers the state of the animal œconomy, the various alterations it suffers from the stagnation of its more viscid juices in the smallest canals, and how much the impulse and force of the circulating blood, by which obstructions are to be removed, must be increased by its carrying along with it such particles as the mercurial globuli; will perhaps see good reason to allow, that the prudent management of quicksilver may do that in some obstinate and dangerous diseases, which we cannot promise ourselves from any other of our known medicines whatsoever.

But I shall not enlarge upon this head. The learned Dr Cheyne has thoroughly explained the mechanism by which such effects as these are produced ‡. However, as all great medicines are to be looked upon as edge-tools, so this, as much as any, requires caution; and indeed more than is commonly observed by those who are most bold in the use of it.

For it cannot be denied, that the excessive gravity alone of this mineral, however serviceable in other re-

* De morb. Gallic. cap. lxxvi.

† De morb. Gall. inter autores de morb. Gall. p. 599.

‡ New theory of continual fevers.

spects, may, if it happens to lie in any quantity in the interstices of the nervous filaments, induce symptoms of dangerous consequence, as spasms, contractions, palsies, &c. which we find they commonly suffer, who have either been for a long time employed in rubbing quicksilver upon looking-glasses, or in any work by which they are obliged to draw in mercurial fumes with their breath, or who have been too much daubed with mercurial ointments; as shall be observed anon.

Neither is this all. Experience has convinced us, that repeated doses of crude mercury have in some cases, even a considerable time after they have been taken, exerted their force, and thrown the body into unexpected disorders.

I remember two accidents of this kind, (and one of them proved fatal), in which, when small quantities had been given for many days together, a violent salivation ensued more than two months after the use of it had been left off.

And not long since, I saw a young lady, who having swallowed about six drachms every morning, three successive days, was salivated three weeks. The flux then ceased, but returned after six months, and held a month; and once more came on, in the same manner, two months after. The breath was each time strongly affected, as is usual in mercurial spitings. So surprisingly active is this mineral, even simple and uncompounded.

We may learn from hence, that it will be always right, in dealing with this slippery remedy, to take care that it has a free passage through the body; which must be done either by purging, or by combining

ning it with substances, which will carry it off either by perspiration or urine : for what is called alcalising it, does not deserve the name of a preparation.

Now as to sublimate, most certain it is, that the saline particles impart to the mercury this noxious quality ; or, to speak more properly, that the salt receives from the mercurial corpuscles such an increase of its gravity and momentum, as renders its cutting corrosion more effectual and penetrating : for the manner after which this matter is done, is probably this.

The compounding parts of the mercury, though so minutely divided by the action of the fire, as to rise in the form of a fume, yet are still solid and ponderous bodies : and by reason of their extreme parvity, being perhaps simple and elementary corpuscles, they will easily be lodged in the pores and interstices of the saline crystals ; which being composed of the atoms of salt, variously by sublimation combined and united, are a kind of cutting lamellæ or blades ; the force of which could never have been very penetrating, upon the account of their lightness and easy dissolution, if the mercury, without blunting their edge, or breaking their figure, did not lend them an additional weight, and thus at the same time strengthen their action, and prevent their quick solution by the juices of the stomach : which cannot now disjoin their compounding parts, because the vacuities, into which they should, in order to do this, insinuate themselves, are already possessed, and taken up by the mercurial globules.

In short, these crystals, which are to be considered as so many sharp knives or daggers, wounding and

stabbing the tender coats of the stomach, and abrading their natural mucus, will irritate the nervous liquor : upon which convulsions and vomitings, with excessive pains, must follow. And the blood-vessels being at the same time pricked, all the adjacent parts will be inflamed, the blood will stagnate : then come on ulcers, which, though singly small, yet being many in number, do all together make up large gangrenes.

This being the nature of sublimed mercury, it may not be amiss to inquire, how it comes to pass, that this same compound resublimed with live mercury in the proportion of four parts to three, (for the sublimate will not take up an equal quantity), especially if the work be repeated three or four times, loses its corrosiveness to that degree as to become not only a safe, but, in many cases, a noble medicine. For I do not see, that any of the chemical writers have hit upon the true solution of this phenomenon.

Here then it is to be considered, that the action of the saline crystals depending upon their solidity and largeness, these must necessarily, by every subsequent sublimation, be broken into smaller and smaller parts. The mercurial globules, (for the reasons given by the author of the forementioned theory of fevers), arising more quickly and easily than the salts, quit the interstices in which they were lodged, and the crystalline blades are divided every time more and more by the force of the fire : whereupon a new combination of parts succeeds. And although there be a greater proportion of the mineral to the salts than before, which makes dulcified mercury specifically heavier than the corrosive ; (for this contains two parts of salt, and

and one of mercury; whereas the dulcified, well prepared, has equal parts); yet the broken pieces of the crystals uniting into little masses of differing figures from their former make, those cutting points are now so much smaller, that they cannot make wounds deep enough to be equally mischievous and deadly; and therefore do only vellicate and twitch the sensible membranes of the stomach to that degree, as excites them to an excretion of their contents and glandular juices, upward or downward, according as the force of irritation is greater or less.

Thus a violent poison is mitigated into a vomit or purge: nay, it may easily happen, (especially in robust constitutions, and if the bowels be at the same time by any means defended against the stimulating power of the medicine), that this twitching may be so slight, as to be almost insensible, and hardly troublesome. And then the mercurial globules, being freed indeed from most of the saline parts in their passage through the primæ viæ, but still having a mixture of some few of them, are quickly conveyed into the blood; where, by their motion and weight, they must necessarily dissolve the preternatural cohesions of all the liquors, particularly of those which circulate in the smallest canals, and are most viscid and tenacious, making them more fluxile and thin, or of more easy secretion. Whereupon all the glands of the body are, as it were, set to work, and scoured of their contents: but the salival ones especially, being many in number, very large and wide, and the juice they separate of a tough and ropy substance, so that a considerable quantity of it is accumulated, before it is forced out at the orifices of the ducts; these effects will

will be most remarkable in them, and a salivation or spitting must continue so long, till the active mineral particles are, through these and the other passages, discharged out of the body.

As the difference between mercury corrosive and dulcified lies in a greater and lesser degree of operation and force, so this same consideration distinguishes the several preparations of this mineral from each other; which though very many, yet do all vary their effects in the body, only according as the mercurial globules are differently combined with salts, and the points of these more or less broken by the action of the fire, in the burning of spirits upon them, and such like managements: and therefore, however dignified with the great names of arcana, panaceæ, prince's powders, &c. they do not afford us any thing singular and extraordinary, beyond what we may with equal advantage promise ourselves from some or other of the most common and usual processes.

We may also fairly conclude from this reasoning, that the safest way of raising a salivation is by internal medicines: since whatever mischiefs can be apprehended from these, may in a greater degree follow from the external use of mercury: not only because, as we have already hinted, the mineral globules, being intimately combined with salts in the several preparations given inwardly, will, by the irritation of these, be easily and fully thrown out at the organs of secretions, till the blood is quite discharged of its load; whereas in all the daubings with mercurial ointments, we can never be certain, that none of the heavy particles are left lodged in the interstices of the fibres, or cells of the bones; but also in as much as, by computing

puting the portion of mercury in all the doses necessary to promote a spitting, and the weight of the same mineral usually applied when this is done by unction, it will appear that the quantity in the latter case vastly exceeds that in the former, and consequently that the inconveniencies to be feared will be in the same proportion.

Therefore this external management of quicksilver is chiefly to be recommended where the constitution is not broken, or ulcers and tumours require a particular cure, by liniments, &c. and a more thorough cleansing of the body. And even in such cases, it will certainly be best to anoint daily with small quantities, and not to raise a high spitting; but promote the other secretions, particularly sweating and urine, by plentiful drinking of thin liquors; and also, if there be occasion, by laxative medicines: for it is well known, that cures are often wrought by these means, although the mouth has never been ulcerated by the mercury. At least this method will be a remedy for a time; and enable the patient to recover strength; so that he may afterward, if it be necessary, undergo a more severe treatment.

It may be observed, that as the earliest use of mercury was in unguents and emplasters, so most of the prejudices and outcries against it are owing to effects produced this way. For the first attempts of the cure of venereal maladies by this remedy were learned from the Arabians*, who, having recommended mercurial ointments in the lepra or scabies, gave a handle to

* Vid. Joan. Baptist. Montan. tract. de morb. Gall. inter autor. de morb. Gall. p. 482. & Fallop. de morb. Gall. cap. lxxvi.

the Italian physicians to try their efficacy in removing the foulness of the skin from a new and terrible contagion: neither were they sparing of their liniments, which they continued to rub in for twelve, fifteen, nay sometimes for above thirty days together *. So that it is no wonder, if they often met with very untoward symptoms from so severe a treatment; and if (as some of them † affirm) they now and then found mercury in the rotten bones of their patients, who had, it may be, suffered too much both from their disease and their physician.

There are many histories of this kind; neither are instances wanting in living persons of mercury running out of the body, from a tumour, either suppurated, or opened by a caustic: nay, there is a case upon record, in which, upon opening a vein, some drachms of it flowed out with the blood ‡.

To this examination of the properties and effects of mercury, I shall add an inquiry into the nature of another mineral poison, not very unlike it, either in its make or action; this is arsenic.

There is some confusion in the accounts which authors give of this mineral. This arises from their not distinguishing the arsenic of the ancients from what is now so called. I shall therefore exactly de-

* Nicol. Massa de morb. Gall. tract. iv. cap. 2.

† Argentum vivum accepi ex osse cujusdam corrupto, quem perunctum ab empyricis plus decies ferebant, non semel emanavisse. Anton. Gall. in lib. de ligno sancto non permiscendo.

Non semel in sepulchris argentum vivum in mortuorum caputibus reperi. Anton. Musa Brasavolus in tract. de morb. Gall.

‡ Vid. Ephemerid. Germanic. dec. 3. ann. 5. observ. 172.

scribe both the one and the other, not only from the latest writers of natural history, (for what Agricola, Matthiolus, Schroder, and even Wepfer, the best authors extant when this book was first published, have delivered to us on this subject, is all wrong), but more particularly from some experiments communicated to me by the learned Dr Hampe, a most excellent chemist, physician to her Royal Highness the Princess of Wales.

The arsenic of the Greeks, *Ἀρσενικόν* or *Ἀρρίπικόν*, was what the Latins named *Auripigmentum*, we *orpiment*.

This is found in Greece and Hungary, in particular mines and veins, and is never mixed with any other mineral. It is of a foliaceous or laminated texture, and contains a great deal of sulphur; as appears by its inflammability, and by its giving, when mixed with mercury sublimata, a true cinnabar. By simple fusion it runs into a mass of a cinnabarine colour, called *sandaracha*. Though it yields a regulus, in every respect like to the regulus of true arsenic, yet it does not act as a strong poison. Hoffman * gave a good quantity of it to a dog, without any harm. The reason of this is, because its metallic particles are combined with sulphur, and not with salt, at least in any considerable degree.

Such a composition makes this substance more useful in painting than in physic; and, together with its colour, has induced those chemists who have fancied that metals may be transmuted, to take it for the subject-matter of their great work: for so they call the making of gold. They have very fondly grounded

* Observ. physico-chym. lib. iii. obs. 1.

their

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their hopes upon some odd ænigmatical verses in the Sibylline oracles *. But though some learned men have attempted to explain this riddle, as descriptive of the Greek name Ἀρσενικόν; yet none have so far succeeded, as fully to reconcile the numbers therein expressed at length, with those contained in the letters of which that word consists †. However, be that as it will, true it is, that this great expectation from this mineral is as old at least as the time of Caligula, that is, of a more ancient date considerably, than the far greatest part of these supposititious and ill-contrived compositions, which bear the sacred name of *oracles*: for that covetous emperour, as Pliny relates ‡, ordered a great quantity of orpiment to be melted and manag'd, that he might extract gold out of it; and made some, but (as it usually happens in such experiments) the profit did not answer the expense.

What we now call *arsenic* is of three sorts, white, yellow, and red. All these are factitious, and very probably not known to the ancients. They are made in this manner.

At Schneebergh in Misnia there is found, in great quantities, a particular kind of mineral called *cobalt*, of a greyish colour, and ponderous. This roasted and calcined, in a furnace made for that purpose, yields a white smoke, which gathers, at the end of a very long funnel, into an ash-coloured powder,

* Ἐννίχ γραμμαὶ ἔχω, τετρασύλλαβός εἰμι, νόμι με.
Αἱ τρεῖς αἱ πρῶται δύο γραμμαὶ ἔχουσιν ἑκάστη.
Ἡ λοιπὴ δὲ τὰ λοιπὰ, ἣ εἰσὶν ἄφωνα τὰ πέντε.
Τὴ παντὸς δ' ἀριθμῷ ἑκατοντάδης ἐστὶ δις ὀκτώ,
Καὶ τρεῖς τρεῖς δεκάδης, καὶ δις τρία.

Lib. i.

† Vid. Fabric. bibl. Græc. v. xii. p. 696.

‡ Nat. hist. lib. xxxiii. c. 4.

as fine as flour. This, with the addition of a true proportion of potash, is sublimed, and gives the white crystalline arsenic *.

The metallic earth, of a vitreous nature, which remains after this operation, melted with a due proportion of calcined flints and potash, makes what is called *smalt*. The cobalt contains about three parts of arsenic, and one of this earth.

When newly sublimed and perfectly pure, it is a shining white transparent body, not unlike to a metallic glass; in the air it changes its bright whiteness to a milky colour, and becomes entirely opaque. It is not inflammable; but evaporates in the fire, without leaving any earth behind, in a white smoke, smelling like garlick. It affords a semimetallic regulus, both by sublimation and precipitation. The first is foliaceous, light, and spongy; the other ponderous, though also of a foliaceous texture, and resembles bismuth. This last regulus may be made without iron, with the black flux only; or with nitre and tartar, in the same manner as is the regulus of antimony; but it requires a nice operator.

White arsenic is entirely soluble in water. If one part of it be sufficiently boiled in fifteen parts of distilled or rain water, it gives by evaporation salts of triangular planes, which unite into octoedral crystals: and in these, either beat to powder, or dissolved by boiling, metallic globules, resembling those of quicksilver, are plainly discovered by the microscope. Which confirms what Kunckel says, that a great part of arse-

* See Kunckel's annotations upon Neri's art of glass, in German; and Philosophical Transact. No 293.

nic is mercury *: so that arsenic may be defined to be a volatile metallic salt.

Yellow arsenic is prepared by subliming white arsenic with the addition of a tenth part of sulphur. This is not so transparent as the white, but splendid, and very like to a metallic yellow glass.

The red differs from the yellow only in this, that a greater quantity of sulphur is added, together with a particular kind of a red cobalt called *kupfer nickel*.

This being the composition of this mineral, we may readily understand the manner of its deadly operation. The case is plainly the same with that of sublimate corrosive: and as there the salts combined with the mercurial globules form cutting crystals; so here the metallic particles, which make the regulus, give a force and solidity to the saline bodies, which wound the stomach and guts, as the others do, even to such a degree as to cause mortifications.

The several histories related by Wepfer † put this out of question: it is sufficient to our purpose to mention one.

A dog having eat some fat mixed with white arsenic, died the next day. The upper part of the stomach, when opened, was red and inflamed; the coats thinner than ordinary; the bottom of it was covered with a fetid slime, and some pieces of fat: the thin guts were so corroded, as to be pervious in three places, two of the ulcers so large that they would easily admit a bean: the cavity of the abdomen contained a yellowish ichor tinged with blood.

* Chemical philosophy confirmed by experiments, chap. xi. in Pyrotechnical discourses. Lond. 1705. 8vo.

† Cicut. aquat. hist. p. 274. & seq.

The case being thus, one would wonder, what should induce authors to prescribe so corrosive a mineral to be worn upon the pit of the stomach, as an amulet against the plague. This trick we may well believe to be dangerous, when Lionardo di Capoa * tells us of a child killed by the violent vomiting and purging, occasioned from a slight wound made in the head by a comb wet with oil, in which arsenic had been infused : for the pores of the body being opened by heat and exercise, some of the noxious effluvia might easily insinuate themselves into the part. Accordingly Crato † observed an ulcer of the breast caused by this application ; Verzascha ‡ violent pains, and fainting fits ; Diemberbroeck ||, and Dr Hodges †, death itself.

The truth of the matter is, this practice seems to owe its origin to a mistake. Perhaps some of the Arabian physicians had commended *darfini* worn in a bag for a preservative in plague-time. This in their language signifies cinnamon : but the Latin interpreters retaining the same word in their translations, (as was frequently done), one or other afterward not understanding its meaning, and deceived by the likeness of the sound, substituted in its place *de arsenico*, as if *darfini* were all one with *zarnich*. The authority of the first author served to propagate the error : nor were those wanting, who reasoned upon the matter, and found it agreeable to their philosophy, that this mineral should draw to itself and concenter the arsenical effluvia out of the air, and thus secure the body

* Incertezza de' medicamenti, pag. 82.

† Epistol. 168.

‡ Observ. 66.

|| De peste,

histor. 99. annotat.

† De peste Lond. pag. 239.

from their infection; these being, as they imagined, the common cause of pestilential diseases.

Having thus particularly discoursed of the nature of these two poisons, I shall not need to insist upon any more out of the mineral kingdom.

All of them bear some analogy to the former, and are more or less dangerous, according as their salts receive a differing force from the metallic particles. For this reason, as we have observed, that the most virulent may be mitigated by breaking the points of the saline crystals; so, on the other hand, the most innocent minerals may become corrosive, by combining them with salts; as we see in the several preparations of silver, antimony, iron, &c.

This puts me in mind of making a remark, which I think both curious and useful. It is observed, that the fumes of lead are very noxious to those who are constantly employed in melting it, as plumbers, casters of shot, &c. A learned physician, of my acquaintance, lately told me, that a great artist in this way had assured him, he had found by experience, that this inconvenience did not attend the melting new lead, in any degree so much as it did the melting it when it was old: that he had workmen, who had for many years laboured under him, in casting new metal, and had never suffered in their health by it. This difference he rightly ascribed to the corrosive quality which lead acquires from the salts in the air, by lying long exposed to it.

For the fumes of minerals are only parts of the respective substances minutely divided; and therefore will not only produce suitable effects, but also in a more dangerous way; being not so much guarded against,

gainst, and yet admitted farther into the body, that is, into the lungs, in respiration, as well as into the stomach, by means of the saliva: not to mention the impression upon the spirits in the nostrils, which must certainly be very considerable.

I had once in my possession, given me by an ingenious chemist, a clear liquor, which, though ponderous, was so volatile, that it would all fly away in the open air, without being heated; and so corrosive, that a glass stopple of the bottle which contained it, was in a short time so eroded, that it could never be taken out. The fume from it was so thin, that if a candle was set at some distance from the bottle, upon a table, the heat would direct its course that way; so that it might be poisonous to any one that sat near to the light, and to nobody besides. I know the composition of this stygian spirit; but it is better, that the world should not be instructed in such arts of death. It is sufficient to our purpose to observe, that it was salts combined with metallic bodies.

OF POISONOUS PLANTS.

From minerals we come to poisonous plants. The most noted of these are the cicuta and aconitum. The former is of two sorts, our common hemlock; and the aquatica, which Mr Ray calls *cicutaria palustris tenuifolia*.

What the cicuta, so much in use of old for killing, especially at Athens, was, we don't know: it is most probable, that it was not a simple, but compounded thing. The history of the noble death of Socrates,

related by his disciple Plato *, (if this is not wrought up with more of ornament than truth), seems to evince it to have been a mixture of some anodyne juices with others of a corrosive nature. Theophrastus † says, that Thrasyas, a great physician, had invented a composition, which would cause death without any pain; and that this was prepared with the juice of hemlock and poppy together, and did the business in a small dose.

An extract of this kind might perhaps take away life with such symptoms as this great philosopher went off with, viz. eyes fixed, heaviness and insensibility in the legs, then great coldness in them, which by degrees seized the vital parts.

I am the more inclined to believe this, from what is recorded anciently of the people of Marseilles, that they had a poison kept by the public, in which cicuta was only an ingredient; a dose of which was allowed by the magistrates to any one who could shew a reason why he should desire death. For this custom, as Valerius Maximus observes ‡, came from Greece, particularly from the island Ceos, where he saw an example of it in a woman of great quality, who, having lived very happy ninety years, obtained leave to die this way, lest by living longer she should happen to see a change of her good fortune.

But the *cicuta aquatica*, at least in our colder countries, is much more violent than the other. Wepfer has, in a very learned treatise, described its deadly effects in some children, who by mistake had ate of the roots of it. These were excessive pain and

* Phædon. sub finem. † Hist. plant. lib. ix. c. 17.

‡ Lib. ii. c. 6. § 8. Vid. Ælian. var. hist. lib. iii. c. 37.

heat in the stomach; terrible convulsions, with the loss of the senses; distortion of the eyes; flowing of blood out at the ears; the jaws so hard shut that no force could open them; efforts to vomit, but nothing thrown up; frequent hickups; with a great distension and swelling, especially at the pit of the stomach; and when death had concluded the tragedy, a continued running of green froth at the mouth.

Stalpart Vander Wiel gives the like account of two persons killed at the Hague by the same roots*.

In a dog, that, for experiment's sake, died by this poison, the stomach when opened was found quite constricted, and shut up at both orifices; its inward surface red, with livid spots here and there.

Thus it appears, that this plant consists of hot, acrid, and corrosive parts; which by rarefying the natural juices of the stomach, and hurting its nerves, are the cause of those terrible disorders which have been described.

For upon the sense of a violent irritation and pain, the nervous fluid is by the mind, in a kind of surprise and hurry, determined in great quantities to the affected part; in order to throw off the cause of the disagreeable sensation: which, if the stimulus be not over great, is done by the contraction of the fibres of the stomach, and muscles of the abdomen, causing vomiting. But when the painful twitching is quite intolerable, the business is over-done; and the fibres are drawn into spasms, which contract the mouth of the stomach, so that the noxious matter cannot be discharged, but is kept there in continued force and action. And by the communication of the infection

* Observat. cent. 1. obs. 43.

through

through the nervous system, the whole body quickly suffers; the blood-vessels are torn and broken by the violence of the convulsions, and blood gushes out from the ears, nostrils, &c.

This universal muscular contraction was the reason, that one of the children attended by Wepfer, made urine in the midst of the agony, to the height of five or six feet, with a strength and violence surprising to the spectators.

The case of the aconitum is much the same. This is our napellus or monks-hood; and its effects do so nearly agree with those now related of the cicuta, that I shall not need to recite them: the experiments of Wepfer * are full and convincing. And indeed, as all the histories which this same author has so carefully given us, of trials made with several vegetable poisons, as the solanum, nux vomica, cocculus Indicus, &c. on different creatures, put it out of all doubt, that the common mischief of these is a twitching and slight inflammation of the stomach, with an affection of the nervous fluid; so it appears from hence, that virulent plants, although they may be distinguished even from one another by particular virtues, do however kill by a like operation and force, which differs chiefly in degree from that of noxious minerals.

Nor is it at all strange, that the symptoms from a vegetable, and from a mineral virulency, should be so different, although of the same kind, and only of unequal force: for the more solid parts of minerals, eroding the coats of the stomach, induce a perfect mortification and gangrene, and thus do their work

* Pag. 176. seq.

at once; whereas the weaker salts of plants can make only pungent irritations, upon the painful sense of which the animal is thrown into convulsions, and dies by these prevailing in all parts of the body.

Upon this score, though mineral poisons do not commonly pass the *primæ viæ*, vegetable ones in some cases may: just as we find that those medicines which have a great degree of irritation, presently induce a vomiting; whereas the same twitching a little weakened suffers them to pass into the intestines, and work downward by stools.

By this we may perhaps give some guess at the nature of those poisons with which they tell us the natives in some parts of Africa and India are so expert at killing, that they can do it in a longer or shorter time. These are most probably either the fruits, or the inspissated juices of corrosive plants, which inflaming the bowels, may cause little ulcers there, whose fatal consequences, we know, may very well be slow and lingering.

This I am the rather induced to believe, because an ingenious surgeon, who lived in Guinea, told me, that the antidote by which the negroes would sometimes cure those who were poisoned, was the leaf of an herb, which purged both upward and downward. For by this means the stomach might be cleared from the adhering corrosive parts of the venom. Yet I can hardly think it possible at the same time, that they should be able, by varying the composition or quantity of the dose, to ascertain the time in which it shall kill, to a week, month, &c.; nor have I ever met with any person who could attest this to be matter of fact: though repeated trials and observations

tions may help one well practised in such tricks to give notable conjectures in this point.

The ancients indeed pretended much the same thing with their aconitum, of which they seem to have made a kind of secret and mystery; as we learn from Theophrastus *, who says, "the ordering of this" poison was different, according as it was designed to "kill in two, three months, or a year." But this he relates only as a common tale or opinion, and not as a story to which himself gave any manner of credit.

It is very plain, that the common cure of all poisons taken into the stomach, must be by throwing them up again by vomiting as soon as possible, and defending the membranes from their pungent acrimony. Drinking very large quantities of warm milk, with oil of sweet almonds, till the vomiting ceases, will answer the first intention: the other, in mineral poisons, (for the effects of the vegetable, after they have been vomited up, generally go off, by diluting plentifully with soft and fat liquids), requires particular care, which, I think, may be in this way. We have found the force of these to depend upon a combination of metallic particles with saline crystals: therefore the disuniting of these must destroy their power. This (as Kunckel † has hinted) may be done, by drinking a quantity of a lixivium, made by a solution of salt of tartar in water: for this salt, uniting with the corrosive crystalline salt, will (after some degree of effervescence) kill it, as the chemists speak;

* Hist. plant. lib. ix. c. 16.

† Chemical philo-

sophy confirmed by experiments.

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by which means, being disengaged from the mineral globules, it will be rendered of no effect.

This practice is founded upon a remarkable experiment, related by the same author ; which is this. A child's head, for the cure of scabs, was daubed over with an ointment made of ung. pomat. and sublimate corrosive : this immediately caused such a swelling, with intense pain and inflammation, that the eyes and nose could not be seen. In this extremity, when the patient was thought to be dying, a learned chymist, happily coming to the house, advised to foment the head all over with a strong lixivium : this, in a few hours, quite removed the terrible symptoms.

What such an application could do outwardly, it may, upon the same rational grounds, be presumed it will perform likewise in the stomach, at least in some degree ; and thus become an antidote against the most violent of all known poisons.

E S S A Y V.

OF OPIUM.

THE ancients having experienced, that opium would oftentimes kill, though taken in no large quantity, ranked it with poisons, and gave it the first place among those which from their stupefying quality they called narcotic.

True indeed it is, that we do every day find this to be, in a small dose, one of the most noble remedies in the world. But it is not worth the while to engage in the controversy, how far poisons are medicinal : since it is notorious enough, that medicines sometimes

sometimes prove poisonous. And take the matter as we please, it may serve to very good purposes to understand the manner of operation of so celebrated a drug, and help us in a great measure to ascertain its use in different cases, if we are beforehand rightly apprised of its nature and way of acting.

In order hereunto, it is necessary, besides some other præcognita, since one of the chief virtues of this medicine is hypnotic, to define distinctly what sleep is, or rather, (to avoid confusion and disputes about words), what difference there is between an animal body, when asleep and when awake: for I suppose the history, manner of preparing, &c. of opium, to be already known.

First, then, there is no one but knows, that in sleep there is a cessation from action. When waking, we walk, discourse, move this or that limb, &c. but in natural and undisturbed rest there is nothing of all these: that is, whereas, being awake, we perform several motions by the voluntary contraction of our muscles; when asleep, those muscles only are contracted, whose action is in a manner involuntary, or to which the mind has always so constantly determined the spirits, that it does it by a habit, without the intervention of the reasoning faculty: such are those of the heart and breast.

So that there is at this time a kind of relaxation or looseness of the moving fibres of the several members; or at least such a quiet position and state of them, by which all the antagonist muscles are in an æquilibrium and equality of action, not overpowering one another. For this indeed seems to be one great design of sleep, to recover to the parts overstretched by

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by labour their former tone and force : and therefore we naturally, when composing ourselves to rest, put our body into that posture, which does most favour the particularly wearied limbs, and conduce to this end.

In the next place, it is very plain that there is in sleep not only a rest, and suspension from acting, of most of our bodily organs, but even of our thinking faculty too ; that is, (for I would prevent cavils), a ceasing from such thoughts, as when waking we are exercised about, which we reflect upon, and will to employ our mind with. For though dreams are thoughts, yet they are but imperfect and incoherent ones, and are indeed either so faint and languid representations, as to be consistent with our sleep, as some may be ; or else, if they be strong and lively, they are, as every one knows, the interruption and disturbance of it.

From hence it will follow, that the motion of the arterial fluid must be, *ceteris paribus*, more sedate, even, and regular, in the time of sleeping than waking. For, besides the various alterations which in the latter state this receives from the several passions of the mind, the very contractions of the muscles themselves in exercises of the body differently forward its course : whereas in sleep the force of the heart and pectoral muscles being more constant and uniform, gives it a more calm and equally continued impulse.

Hence also it will come to pass, that the influx of the liquor of the nerves into the organs of the body, as also its reflux towards the brain, is in sleep either none, or very inconsiderable ; that is, that this fluid has at this time but little or no motion. For it is muscular action and sensation that require it to be

thus determined this way or that, which are now hardly any. And yet, by the arrival of blood at the brain, this juice will still be separated there, fit to be derived into its canals or tubes: so that by this means there will be a kind of accumulation, or laying up in store, of spirits for the offices and requirements of waking.

Thus we may in short look upon the time of watching, as the time of wearing out, or the destruction of the animal fabric; and the time of sleep, as that in which it is repaired and recruited; not only upon the account of what we have just mentioned concerning the nervous liquor, but also with respect to all the other parts, as well fluid as solid. For action does necessarily by degrees impair the springs and organs; and in motion something is continually abraded and struck off from the distractile fibres, which cannot otherwise be restored than by their being at rest from tension. Besides that, such a regular and steady course of the blood, as we have observed to be in sleep, is by far more fit and proper for nutrition, or an apposition of parts to the vessels, which an uneven hurry of it is more apt to tear off and wash away.

The case being thus, it is very plain, that whatsoever can induce such a disposition of the fluids and muscular parts of the body, as this we have described, will so far cause sleepiness. And in like manner, when any thing interposes and hinders this composedness and tranquillity, the removing of the impediment will be the causing of sleep: inasmuch as this is only reducing the animal oeconomy to its right state, in which by natural order there must be a succession of sleeping and waking.

Thus

Thus it appears how necessarily continued exercises make us sleepy, since these exhaust the juice of the nerves; that is, both lessen its influx into the organs of motion, and incline the mind not to determine it any longer that way, upon the account of the pain and uneasiness with which too violent a tension of the parts is always attended: which therefore we must needs desire to relax, or lay to rest.

That sleepiness which follows upon a fulness of the stomach after eating or drinking, is owing to a different cause; and does indeed so nearly fall in with the effects of opiate medicines, that it requires a particular consideration.

As hunger, or the emptiness of the stomach, is a painful sensation; so the satisfying, or removing of this, is a pleasing or agreeable one. Now, all pain is a stimulus upon the part affected; and this, we all know, being attended with contractions of the pained membranes, causes a greater afflux than ordinary of the nervous juice that way. On the other hand, pleasure, or a delightful sensation in any part, is accompanied with a smooth undulation, and easy reflux of the liquor of the nerves towards the brain. This is, as it were, the entertainment of the mind, with which being taken up, it does not determine the spirits to the organs of motion: that is, there is such a relaxation of the muscular fibres, and such a disposition of the nervous fluid, as we have observed to be necessary to sleep.

This is the reason of that chilliness in the limbs which we commonly complain of after a good feast.

If it seem strange, that a pleasure in the stomach should so powerfully influence the mind; let it be

considered, on the other hand, how violent effects an uneasy and disagreeable sense in the same part does produce; what a terrible agony two or three grains of crocus metallorum throws the whole fabric into; how readily the fluid of the nerves is with a more than ordinary impetus determined and commanded into the muscles of the stomach and abdomen, in order to throw off the enemy, and remove the ungrateful sensation.

Now, the consequences which we have ascribed to a pleasing sense in this part, are only just the contrary of these we find the opposite affection of pain induces. And indeed pleasure and pain are two great springs of action in the animal œconomy; the changes they make in the fabric are the causes of many effects which seem surprising, because we do not regard the mechanism by which they are produced; but these must be more considerable in the stomach than any where else; this part being, for very wise purposes, of so acute a feeling, that some philosophers have for this reason thought it to be the seat of the soul.

Besides this consideration, we must take notice, that the stomach, being distended with food, presses upon the descending trunk of the aorta, and thus causes a greater fulness of the vessels in the upper parts: whereupon the brain is loaded, or the derivation of spirits into the nerves diminished, and inactivity or drowsiness ensues. From hence proceed those flushings in the face, redness, &c. after plentiful eating or drinking, most visible in those whose vessels are lax and weak; as in exhausted and hectic persons they more especially are.

Thus

Thus we may, without the assistance of the new chyle entering into the vessels, account for that inclination to sleep, which follows upon a full stomach; though we must also allow the distension from this to be a considerable cause of the same effect. But this does not happen immediately, nay, sometimes perhaps not within two or three hours after eating: and therefore the sudden drowsiness must (as well as the present refreshment and reviving which meat gives) be chiefly owing to some more speedy alteration.

We come then, in the next place, to opium itself; the chemical analysis of which, out of six ounces, afforded, of a volatile alkaline spirit, not very unlike to that drawn from hartshorn, two ounces; of foetid oil, five drachms, one scruple, sixteen grains; of coal, void of salt, two ounces, two drachms, one scruple, four grains.

The virtues therefore of opium are owing to a volatile alkaline salt, intimately mixed and combined with an oily, sulphureous substance: the effects of which we must consider, first of all upon the stomach, and afterwards, when they have passed the *primæ viæ*, upon the arterial fluid itself.

An agreeable sensation produced in the stomach, together with a distension of its membranes, we observed before to be the cause of that sleepiness to which we are so prone after eating. The one of these engages the mind, the other acts upon the body. For pleasure amuses the soul, as it were, so that it does not think, or exercise itself about any outward objects; that is, is inclined to rest. And the fulness of the vessels in the brain checks and hinders, in
N. 3 some

some measure, the derivation of the nervous juice into the organs, &c.

Now, they who take a moderate dose of opium, especially if not long accustomed to it, are commonly so transported with the pleasing sense it induces, that they are, as they oftentimes express themselves, in heaven: and though they do not always sleep, (which proceeds from the presentation of pleasing images to the mind being so strong, that like dreams they over-engage the fancy, and so interrupt the state of rest), yet they however enjoy so perfect an indolence and quiet, that no happiness in the world can surpass the charms of this agreeable ecstasy.

Thus we have from this medicine, but in a far more eminent degree, all those effects which we observed to follow upon that grateful sense in the stomach which a moderate fulness produces. For no bodies are so fit and able pleasingly to affect our sensible membranes, as those which consist of volatile parts, whose activity is tempered and allayed by the smoothness of some lubricating and oily ones: which, by lightly rarefying the juices of the stomach, and causing a pleasant titillation of its nervous coat, will induce an agreeable plenitude, and entertain the mind with ideas of satisfaction and delight.

The case being thus, we easily see upon what mechanism the other virtues of opium depend, its easing pains, checking immoderate evacuations, &c. not only in that the mind being taken up with a pleasing sense, is diverted from a disagreeable one; but all pain being attended with a contraction of the part, that relaxation of the fibres which it now causes, eludes and destroys the force of the stimulus.

In like manner, in immoderate secretions there is most commonly an irritation of the organs, the removal of which will abate the discharge. And herein lies the incrassating quality of this medicine, in that the twitching sense upon the membranes of the lungs, bowels, &c. being now lessened, the sharp humour is suffered to lodge there in a greater quantity, before it is so troublesome as to be thrown off and expelled: it being all one as if there were no irritation of the part, if the uneasy sense thereof be not regarded by the mind.

These effects will all be heightened by the mixture of the opiate particles with the blood; which is hereupon rarefied, and distends its vessels, especially those of the brain: and this does still to a greater degree lessen the influx of the nervous fluid to the parts, by pressing upon the little tubuli, or canals, through which it is derived.

This is the reason of that difficulty of breathing which they for a time experience, who take this kind of medicine, this symptom being inseparable from the rarefaction of the blood in the lungs.

From hence it appears, that the action of opium is very analogous to that of other volatile spirits, only that a small portion of it has a force equal to that of a greater quantity of most of them.

This is very evident in those who accustom themselves to take large doses of it; as the Turks and Persians do to that degree, that it is no uncommon thing there to eat a drachm or two at a time: for the effects of it in them are no other than downright drunkenness; upon which account * it is as common

* Vid. Belon. voyag. lib. iii. c. 15.

a saying with them, and on the same occasion, " He
" has ate opium ;" as with us, " He has drank too
" much wine."

Neither indeed do they otherwise bear such large quantities of it, than our tipplers will a great deal of brandy ; that is, by habituating themselves to it by degrees, beginning with small doses, and requiring still more and more to raise themselves to the same pitch. Just as Galen * tells us of a woman at Athens, who by a gradual use had brought herself to take, without any hurt, a considerable quantity of cicuta, or hemlock. Which instance is the more to our purpose, because Nic. Fontanus † knew one, who being recovered of the plague, and wanting sleep, did, with very good effect, eat hemlock for some time ; till falling ill again of a fever, and having left off the use of this remedy, he endeavoured to procure rest by repeated doses of opium, which (nature having been accustomed to a stronger alterative) had no operation, till the help of cicuta was again called in with desired success.

It is a sufficient confirmation of all this reasoning, that Prosper Alpinus ‡ observed among the Egyptians, those who had been accustomed to opium, and were faint and languid through want of it, (as drinkers are if they have not their liquor), to be recovered, and put into the same state of indolence and pleasure, by large doses of Cretic wine made hotter by the infusion of pepper, and the like strong aromatics.

Nor is it perhaps amiss to remark, that in mania-

* *Simpl. medicam. facult. lib. iii. c. 18.* † *Re-
spons. et curat. medic. p. 162.* ‡ *Medicin. Ægypt.
lib. iv. c. 1.*

cal people, as is frequently observed, a quadruple dose of opium will scarce produce any considerable effect. Now, in persons so affected, the mind is deeply engaged, and taken up with some images, or other, as love, anger, &c. so that it is not to be so easily moved or diverted by those pleasing representations, which it would attend to at another time, and upon which the virtues of this medicine in a great measure depend. Besides this, those who are maniacal do to a wonder bear the injuries of cold, hunger, &c. and have a prodigious degree of muscular force; which argues the texture of their blood to be very strong, and the cohesion of its globules great: so that the spirituous parts of the opiate cannot make that disjunction and rarefaction of this fluid in them, which it does in ordinary bodies and constitutions.

Many are the improvements which might be made of this theory, with relation to the practice of physic: but these will be obvious enough to one instructed in the animal œconomy.

I cannot, however, omit two useful remarks from it. The first is, that by not understanding the manner in which this noble medicine acts, when it checks immoderate secretions, physicians are often led into wrong methods, and give it to stop those evacuations in which there are no spasms or painful irritations; as particularly, in colliquative diarrhœa's attending hectic fevers: whereas, it is manifest, it must in such cases (without the desired effect) do real mischief, by relaxing the fibres, and heating and rarefying the fluids, already too thin and broken in their texture.

And, on the other hand, it is easily seen, that this
same

same property, by which it takes off cramps in the nerves, and thus cures excretions depending upon them, will very often happily promote those discharges which are natural, when they are unseasonably interrupted by violent contractions. Thus opiates, in nephritic pains, move the urine stopped by gravel and stones; and, in uterine cases, assist nature in propelling the menses, the foetus, and the lochia.

To conclude then, it is very plain, that there needs no more to make opium prove destructive or a poison, than to take too great a quantity of it: for then it must inflame the stomach, and rarefy the blood to such a degree, that the vessels cannot again recover their tone; whereupon apoplectic symptoms, &c. will ensue.

To be convinced of this, I forced into the stomach of a small dog about half a drachm of crude opium dissolved in boiling water. He quickly vomited it up with a great quantity of frothy spittle; but repeating the trial, by holding up his head, and beating him, I made him retain three or four doses, intermitting between each about a quarter of an hour. When he had thus taken, as I could guess, near two drachms, I watched him about an hour: then he began to sleep, but presently started up with convulsions, fell into universal tremblings, his head constantly twitched and shaking, he breathed short and with labour, lost entirely the use first of his hinder legs, and then of the fore ones, which were stiff and rigid like sticks. As he lay snorting, to hasten his end, I was giving him more of the solution; but on a sudden his limbs grew limber, and he died.

Opening his stomach, I found it wonderfully distended,

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tended, though empty of every thing but some water and opium; parcels of frothy mucus swimming in it; the inside was as clean as if scraped and washed from all the slime of the glands, with some redness here and there, as in a beginning inflammation. The pylorus was contracted. The blood-vessels of the brain were very full: and I took out a large grume of concrete blood from the upper part of it, cutting into the sinus longitudinalis, as is not uncommon in apoplectic carcases; but found no extravasated serum in the ventricles, nor among any of the membranes.

As to the cure in such cases; besides emptying by vomiting, bleeding, and blistering, acid medicines and lixivial salts are the proper remedies. These contract the relaxed fibres, and by their diuretic force make a depletion of the vessels. I have particularly, with extraordinary success, given repeated doses of a mixture of salt of wormwood with juice of lemons. This is the foundation upon which Van Helmont prepared his laudanum cydoniatum, and Starkey his pacific pill. Generous wine, which the ancients gave for an antidote, can be no otherwise useful, than as it dissolves the resinous clammy part of the opium sticking to the coats of the stomach, and so forwards its expulsion by other helps, which cause a contraction of the muscular fibres.

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AS an appendix to this discourse, I shall subjoin an account of another poison, very different from any we have described, but nearly related to those called *narcotic*.

This

This is the simple water distilled from the leaves of the laurocerasus, or common laurel: the bad effects of which were first observed some years since in Ireland; where, for the sake of its flavour, it was frequently mixed with brandy.

A small quantity of this killed two women who drank it, very suddenly. Hereupon a learned physician, surpris'd at the event, (this plant having never been thought to be any wise noxious), made several experiments with it upon dogs, which were afterwards, some of them, repeated here, with the same fatal success *.

From all these, but more particularly from observations communicated to me by Dr Nicholls, (which he had made in his anatomical lectures), I shall give a short description of the appearances in the animals put to death in this uncommon way.

All the dogs fell immediately into totterings and convulsions of the limbs, which were presently followed by a total paralysis, so that no motion could be excited even by pricking or cutting them.

No inflammation, upon dissection, was seen in any of the internal membranes. The most remarkable thing was, a great fulness and distension of the veins, in which the blood was so fluid, that even the lymph in its vessels was generally found tinged with red.

The same water, injected, as a clyster, into the intestines, had always the like effects, in a very few minutes.

To make the manner of acting of this poison more evident, Dr Nicholls prepared a quantity of it much stronger than ordinary, by cohobating, (as the chemists call it), or distilling it twice from fresh leaves.

* Vid. Philosoph. Transact. No 418. and 420.

By this proceeding he had about a drachm of a heavy oil, of the colour of olive oil, subsiding at the bottom of about three pints of water : this, by frequent shaking, was quite incorporated again with the water.

About two ounces of this killed a middle-sized dog, in less than half a minute, even while it was passing down the throat.

I do not know a more convincing proof of what I have all along affirmed, that all poisons act principally upon the nervous fluid, than this seemingly innocent water gives us. That a simple liquor, without any extraordinary sensible qualities, should even in its passage into the stomach, nay, when thrown into the lower guts as a clyster, instantaneously kill, and that without any marks of inflammation or corrosion, can no other way be accounted for, but by an immediate effect upon the animal spirits.

If what I have, in the introduction, conjectured concerning the nature of the nervous fluid, be right ; the elastic matter, which enters into its composition, must, in the membranes, suffer a repulsion from some active particles in this water ; (as we see in many experiments of electricity, it is in this manner affected by several bodies meeting with it) : in consequence of which, the nerves, first of the membranes which it touches, and then of all the organs, must lose their action. Hence it is that animals killed this way, after strong convulsions, die universally paralytic : and a sudden stop being put to the circulation, the blood remains in perfect fluidity in the veins.

More will be said to this purpose in the following essay. I shall only add here, that the deadly power of this water seems to be entirely owing to its being

over-saturated with that heavy oil which we have mentioned; and therefore Dr Nicholls experienced, that ten drops of a red oil, (like to this, of a kernelly flavour and taste), distilled in the same manner from bitter almonds, (after the sweet oil had been expressed), mixed with an ounce of common water, in like manner, killed a dog in about half an hour.

Considering all this, and that it would be a confirmation of what I have asserted, if the application of such substances as draw back the spirits to their membranes, should, by an irritating force, contrary to the repelling liquor, revive the dying animal; we gave to a small dog about an ounce of strong laurel-water. He fell immediately into most violent convulsions, which were soon followed by a total loss of his limbs. When he seemed to be expiring, we held to his nostrils a phial of good spirit of sal ammoniac, and forced a small quantity of the same down his throat: he instantly felt its virtue, and, by continuing the use of it for some time, by degrees recovered the motion of his legs; and, in about two hours, walked about with tolerable strength, and was afterwards perfectly well.

The antidote shews the nature of the poison; and I make no doubt but the same will prove effectual against any others of this kind, which, without an inflaming quality, stupefy, and stop the motion of the nervous fluid.

I give this hint, because it is well known, that the kernels of some fruits, particularly of black cherries, afford by distillation a water, in taste and smell, not unlike to that from laurel or bitter almonds: which, if drawn off very strong, or over-impregnated with

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VENOMOUS EXHALATIONS. 141

the heavy oil, may certainly cause the like bad symptoms. Some trials, as I am informed, have proved this to be so. Upon this account, I think our shops had better be without this water; especially since it is not known to have any medicinal virtue, and is commonly given to infants, easily affected, and subject to convulsions, the very disorder which waters of this kind have been found to produce.

E S S A Y VI.

Of VENOMOUS EXHALATIONS from the EARTH, POISONOUS AIRS, and WATERS.

BESIDES these already treated of, there is yet another way of being poisoned; and that is by venomous steams and exhalations, or a poisonous air taken into the body by the breath.

This is notorious enough, and authors upon many occasions make mention of it; but when they come to explain the particular manner how this kills, they most commonly reduce it to some of the poisons, which prove destructive by being admitted into the stomach: alleging that malignant fumes and airs are therefore fatal, because impregnated with arsenical, mercurial, and the like hurtful *μιασματα* or particles, they convey these into the body; which being of a very corrosive nature, must necessarily do hurt both to the fluid and solid parts.

And indeed that the fumes of these same minerals are very pernicious, and air filled with their atoms very unfit for respiration, is most certain; but to ar-

gue from hence, that all deadly vapours and malignant airs owe their mischief to these only, is too fond and ill-grounded a conceit: since upon a due inquiry it will appear, that there may be, and are, mortiferous exhalations from the earth, infecting the air, of a nature so different from any of those poisons, that the very substance from which they arise, may not be at all hurtful, though taken into the stomach itself.

Venomous steams and damps from the earth the Latins, in one word, called *Mephites* *.

This, as many other Tuscan words, comes from a Syriac theme, which signifies to blow or breathe †. And in ancient times several places were remarkable for them: so the Mephitis of Hierapolis was very famous, of which Cicero, Galen, but more particularly, and from his own sight and knowledge, Strabo ‡ makes mention.

Such another was the Specus Corycius in Cilicia, which, upon the account of its stinking deadly air, such as is thought to proceed from the mouth of dragons, which the poets give to Typhon, was called *Lubile Typhonis*. This Pompon. Mela || describes; and it is indeed as ancient as Homer †: for Arima, in which he places it, was, as Eustathius observes, a mountain of Cilicia.

Neither are such fumes as these now infrequent; and though mostly found in mines, pits, and other

* Virgil. *Æn.* vii. v. 84. — Sævamque exhalat opaca mephitim. Vid. Servium, *ibid.*

† Scaliger. conject. in Varron. ‡ Lib. xiii.

|| De situ orb. lib. i. c. 13.

‡ Εἰν Ἀρίμοις ὅτι φασὶ Τυφώος ἔμψυται σῆμα. Il. β. ver. 783.

subterraneous places, yet they are sometimes met with on the surface of the earth too, especially in countries fruitful of minerals, or pregnant with embowelled fires: such are Hungary and Italy, which latter, as Seneca * takes notice, has always been remarkable for them.

I shall therefore, having had the opportunity of making some remarks upon one of the most famous of all in those parts, give as good an account as I can of that, and its manner of killing; which though I dare not affirm to be applicable to every Mephitis, yet seems plainly to be the case of most of them: and where it is not, this simple mischief will only be found to be complicated with another; and then some extraordinary symptoms, or appearances in the animals killed, will easily make a discovery of the additional venom and malignity.

This celebrated Mofeta, taken notice of (or at least some other hereabouts) even in the time of Pliny †, is about two miles distant from Naples, just by the Lago d' Agnano, in the way to Pozzuolo or Pu-teoli, and is commonly called la Grotta de' Cani: because the experiment of its deadly nature is frequently made upon dogs: though it be as certainly fatal to any other animal, if it come within the reach of its vapour. For Charles VIII. of France proved it so upon an ass; and two slaves put into it by order of D. Pietro di Toledo, viceroy of Naples, with their heads held down to the earth, were both killed ‡.

It is a small grotto at the foot of a little hill, a-

* Nat. Quæst. l. vi. c. 28. † Nat. Hist. lib. ii. c. 93. ‡ L. di Capoa delle Mofet. p. 37.

bout eight feet high, twelve long, and six abroad. From the ground arises a thin, subtil, warm fume, visible enough to a discerning eye, which does not spring up in little parcels here and there, but is one continued steam, covering the whole surface of the bottom of the cave; and has this remarkable difference from common vapours, that it does not, like smoke, disperse itself into the air, but quickly after its rise falls back again, and returns to the earth; the colour of the sides of the grotto being the measure of its ascent: for so far it is of a darkish green, but higher only common earth, and this is about ten inches. And therefore, as I found no inconvenience by standing in it, so no animal, if its head be kept above this mark, is in the least injured. But when (as the manner is) a dog, or any other creature, is forcibly held below it, or by reason of its smallness cannot hold its head above it; it presently, like one stunned, loses all motion, falls down as dead, or in a swoon, the limbs convulsed and trembling, till at last no more sign of life appears, than a very weak and almost insensible beating of the heart and arteries: which, if the animal be left there a little longer, quickly ceases too; and then the case is irrecoverable, as in one perfectly strangled. But if it be taken out in time, and laid in the open air, it soon comes to life again; and sooner, if thrown into the adjacent lake, which by constringing the fibres of the skin, in the manner of a cold bath, puts the blood again into its circulation.

It will afford some light towards the knowledge of the nature of this fume, to mention some other experiments made in the grotto *. A lighted torch,

* Addison's remarks on Italy, p. 230.

snuff and all, goes out in a moment, when dipped into the vapour.

A pistol cannot take fire in it. If a weather-glass be so fixed in the grotto, that the stagnum is wholly covered with the vapour, the quicksilver neither falls nor rises otherwise than in the outward air.

In this short, but accurate history of this grotto, I have set down those particulars which not only distinguish mephitical exhalations from common and innocent fumes, but also give hints sufficient, I think, to determine the reason and manner of their surprising effects.

And not to spend time in refuting the opinion of others, I first take notice, that here can be no suspicion of any such poison as we have described: if there was, animals taken out of the grotto could not so immediately recover from the effects of it, without any remaining appearance of faintness and sickness, or such symptoms as are suffered from inspiring air impregnated with corrosive effluvia; and these would certainly, in some degree at least, infect the air in the upper part of the cave, which is always pure and fit for respiration. Neither could a mischief of this kind be produced, without some marks of it in the creatures killed, when opened: which yet discover nothing extraordinary, either in the fluid or solid parts, except what I shall presently mention in frogs.

In order therefore to understand wherein this deadly power consists, it must be observed, that the use of respiration is twofold; the first, that the blood, in its passage through the lungs, may by the elasticity of the air, distending the vesiculæ, and thus press-

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ing upon the arteries*, be comminuted and broken, so that no cohesion of its parts may hinder the secretion of those humours which in the several glands are to be derived from it: the other is, that the blood may be supplied with something from the air, whatever it be, necessary to life.

That there is a vivifying matter from the air, which passes into the blood by the breath, I have in another place † demonstrated, by observing, that the same quantity of it will not suffice long for breathing, though it be deprived of none of those qualities, by which it is fitted to inflate the lungs, and agitate the blood. And likewise, from the experiment of Dr Halley, who, when several fathom under water, in his diving engine, breathing an air more condensed than the natural, found that he drew his breath more slowly than usual: the reason of which must be this, that when a greater quantity of air than ordinary was taken in at a time, and consequently the blood furnished with more of those particles which are necessary to be mixed with it, a less frequent respiration sufficed.

The case being thus, since (as we have mentioned) the mercury in the barometer is not altered in its ascent by this vapour, that is, there is no want of gravity and elastic pressure in it, at least not to a considerable degree; we must conclude, that there is some quality in it, which, when it is drawn into the lungs, prevents and stops the usual communication of the enlivening spirit from the air to the blood.

We have already taken notice, that there can be no

* Vid. Malpigh. de pulmon. & Bellin. opuscula.

† Discourse on the plague, edit. 9. p. 45.

real poison here. All that is discovered by the earth from which the fume arises, is no more than that it is of a greenish colour, with a subacid taste, very much (as L. di Capoa observes) like to that of the phlegm of vitriol: so that it may very well be called an unctuous vapour, of the vitriolic kind, raised by a subterraneous heat.

It is certainly necessary to the inflation of the pulmonary vesiculæ, and the subsequent entrance of the subtil matter from the air into the blood, that the nervous liquor should have a free course into them: it is therefore highly probable, that these vitriolic particles in the fume have a counteraction or repulsive force to the elastic matter of this liquor; by means of which the fibrillæ, into which it should pass, being destitute of it, become quite relaxed, and lose their force *.

Neither must it seem strange, that the animal spirits should be so suddenly interrupted in their action, by the interposition of a ponderous fluid; since we see every day how instantaneously, on the other hand, their motion is quickened and revived by the application, to the nostrils, of volatile salts: and it may be observed, that these are always alkaline, that is, of a nature quite opposite to vitriolic or acid spirits, so as readily to fall into a conflict or fermentation with them.

To conclude this part of our discourse: I think it a sufficient confirmation of this reasoning, that in frogs killed in this grotto, the bladders of the lungs (more visible otherwise and distinct in these creatures than in most other) were found subsided, and quite empty of

* Vid. essay v. at the end.

air *. But if any one desires a farther proof, he may, according to these principles, make, as L. di Capoa did †, an artificial mephitis: for if antimony, bismuth, or any other such mineral, be finely powdered, and moistened with aqua fortis, or spirit of nitre; there will arise a great heat, with a thick dark smoke, in which, as in this grotto, torches are extinguished, and animals, though but slowly, stifled and killed.

The mortal effects of subterraneous damps, in mines, deep wells, and the like close places; as also of the fumes of confined burning charcoal, may be accounted for in the same way; these being generally acid exhalations from mineral substances ‡. And as in animals which have died in the described grotto, the vesicles of the lungs are found subsided, wanting due tension from the animal spirits; so in the dissection of a man killed by the vapour of wood coals, carried from a baker's oven into a deep cellar, as the story is related in the memoirs of the royal academy at Paris ||, the brain appeared dry, and the muscles of the arms and thighs so relaxed, that they seemed separated from the parts to which they belonged.

But it must here be observed, that, in some cases of this nature, the mineral particles are mixed with so small a proportion of water, that, instead of extinguishing a flame, they will themselves, like gunpowder, take fire, and burn at the approach of a candle. A famous instance of such a vapour is given in our Philosophical Transactions †: and an experiment, made by a mixture of oil of vitriol and filings of

* L. di Capoa, Mofet. p. 40.

† Ibid. p. 128.

‡ Vid. Philos. Transf. N^o 411. & 429.

|| Ann.

1710. p. 17.

† N^o 442.

iron, confirms the truth of our reasonings on this head.

Thus I have shewn how death may enter at the nostrils, though nothing properly venomous be inspired. It might perhaps be no difficult matter to shew, how a lesser degree of this mischief may produce effects, though seemingly very different from these now mentioned, yet in reality of the same pernicious nature; I mean, how such an alteration of the common air, as renders it in a manner mephitical, (which is done by too much heat, and at the same time too great a proportion of watery and other grosser particles mixed with it) may be the cause of epidemic diseases, and, it may be, more especially of those which, by reason of their untoward symptoms, are usually called malignant.

For it is very remarkable, that Hippocrates * observed the constitution of the air which preceded pestilential fevers, to be great heats, attended with much rain and southern winds: and Galen † takes notice, that no other than a moist and hot temperament of the air brings the plague itself; and that the duration of this constitution is the measure of the violence of the pestilence. Lucretius ‡ is of the same mind: for in his admirable description of the plague of Athens, “These diseases” (says he) “either come from the air, or arise from the earth,”

— *Ubi putrorem humida nacta est,
Intempestivis pluviisque et solibus icla.*

* Epidem. lib. ii. & iii. † De temperament. lib. i. c. 4. & commentar. in epidem. lib. iii. ‡ Lib. vi. ver. 1099.

In short, the general histories of epidemic distempers almost constantly confirm thus much ; and would have done it more, if the vain notion of occult venoms had not prepossessed the minds of authors, and made them regardless of the manifest causes.

And this is notorious enough in those countries where malignant diseases are most rife : thus it is a very common observation in the East Indies, that during the dry heats the season is healthful, but when the rains fall immediately upon the hot weather, then untoward fevers begin to threaten.

The same is observed in Africa : for (as Joan. Leo * relates) if showers fall there during the sultry heats of July and August, the plague and pestilential fevers ensue thereupon, with which whosoever is infected hardly escapes.

Whoever reflects on what has been said of the use of respiration, and considers the propositions of Bellini, will easily understand the reason of these events.

This great demonstrator has proved, that malignant and pestilential fevers are owing to a viscid and tenacious lentor or slime, which first obstructs the capillary arteries, and afterwards, being dissolved by heat, ferments with the blood, and changes it to a mass unequally fluid and glutinous.

Now it is plain, that air, together hot and moist, not having force sufficient to comminute the arterial fluid in the lungs, this, when it arrives at the secretory organs, will, instead of deriving into them their proper liquors, leave its most viscid parts sticking about their orifices, which by degrees make obstructions. These

* Hist. Afric. lib. 1. c. 1. Vid. Purchas's pilgrims, book vi. c. 1. Dapper, descriptio Afric. p. 127.

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* Vid.
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can only be removed by the impetus of the succeeding blood, and the agitation of heat; and then this slimy mucus, being again taken into the circulation, will, in the nature of a ferment, disturb the whole mass, and alter its natural properties.

I very well know, that the authority of Hippocrates is brought to support the fancy of a latent aëreal poison in some of these distempers: his *Θείον τι* (something divine *) is construed in this sense. But his best interpreter, Galen, understood by this expression no such thing as they mean: on the contrary, he says, it is a manifest constitution of the air, prevailing unseasonably, such as himself has described in his Aphorisms †; and which is the same with that of which we are discoursing.

Minadous ‡ therefore rightly remarks, that, in his whole epidemics, Hippocrates never once mentions any venom as the cause of malignant diseases; and, as to any thing really divine, the wise old man in other treatises || expressly teaches, "That no disease comes from the gods, one more than another, each acknowledging its own natural and manifest cause."

But it is foreign to our purpose to enlarge on this subject. I shall only hint, that physicians ought therefore to be very cautious in giving, as they often do in cases of this nature, under the notion of alexipharmacs, such medicines as raise a great heat both in the stomach and blood. Having engaged the animal spirits in war with malignities, they too often send treacherous auxiliaries to the supposed weak party;

* Vid. prognostic, & Galen. comment. † Sect. iii.

ph. ii. ‡ De febre malign. lib. i. c. 8. || De

febre, aquis, & locis; & de morbo sacro.

and, by exciting new tumults and disorders, check and interrupt the work of nature, which always endeavours to conquer its enemy by critical discharges.

It must indeed be owned, that some malignant fevers are contagious, and that contagion is a real poison: but the original cause of a disease, and the communication of it, are very different things. Of this I have largely discoursed on another occasion *: I shall therefore only hint here, that when a fever is communicated by way of infection from one already diseased, this most commonly happens at the latter part of the distemper; that is, (as was observed in the hydrophobia), when the fermenting blood is throwing off great quantities of its active particles upon the glands of the most constant and easy secretions: such are those in the surface of the body and the mouth. These therefore being by the air drawn into the lungs of a sound person, and likewise insinuating themselves into the pores of the skin, will affect first the nervous fluid, and then the blood, and produce the like fermentation and disorder, which had been bred in the body from which they arose.

The way by which bad food, ill-ripened fruits of the earth, &c. do often produce malignant and pestilential diseases, is not very different from that by which we have observed unwholesome airs to be the cause of the like effects. For the juices, with which those supply the blood, being corrupted, must necessarily make a fluid neither fit for nutrition nor the animal secretions: and it is therefore no wonder, if, besides the other symptoms ensuing, sore pestules, inflammations, ulcers, &c. (more common in fevers

* Discourse on the plague.

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from this cause than in any other), are raised in the surface of the body.

It is upon this account, that a famine is very often succeeded by a pestilence. And this calamity generally begins among the poorer sort of people, whose diet to be sure is the worst.

It is a constant observation in countries subject to the plague, as Turkey and Africa, that when the common inhabitants die in great numbers, foreigners who live in plenty, if they avoid communication with the infected, escape the danger.

Thus much concerning poisonous exhalations and airs, so far as the consideration of the Grotta de' Cani has led us on to inquire into their effects. For though there may be other alterations of this same element, differing in their nature from this we have insisted upon, and yet equally pernicious and hurtful; yet we take no notice of any of them, in regard that those which are from arsenical, mercurial, and the like fumes, are reducible to a foregoing essay: and those which are owing to a change of the known properties of the air, may be easily explained, by what has been already delivered in this. I shall therefore rather chuse to make some remarks on the mischief of another fluid, which as it is the next in use to this we have been treating of, so the bad qualities of it, when it comes to be altered, must necessarily be almost equally fatal and dangerous.

I mean water, which is of so constant service, not only for our drinks, but also in preparing of our flesh and bread, that it may justly be said to be the vehicle of all our nourishment: so that whenever this happens to have other properties than are necessary

to fit it for this purpose, it is no wonder, if, in its passage through the body, these make suitable impressions there.

Thus at Paris, where a part of the city is supplied with a water from Arcueil, which is so full of stony particles, that even the pipes, through which it runs, are in time incrusted and choked up; Dr Lister has observed, that the inhabitants are more subject to the stone in the bladder, than in most other places*.

In like manner, let the gross particles with which the water is saturated, be of any other nature, metallic, saline, &c. these, according to their various gravity, the capacity of canals, and such like circumstances, will, when they come to circulate in the animal body, be, by the laws of motion, deposited in one part or other. So those mineral bodies, and nitrous salts, which abound in the snowy waters of the Alps, do so certainly stuff and enlarge the glands of the throat in those who drink them, that scarce any who live there are exempted from this inconvenience†.

For this reason, the choice of water for drink among the ancients was by weight, the lightest being preferred, as most free from all heterogeneous bodies.

The case therefore of poisonous springs is, their having corrosive corpuscles mixed with their water, which cannot fail, when forsaken of their vehicle in the canals of the body, to do the same mischief as they would, if taken by themselves undiluted: only with this difference, that they may in this form be carried sometimes farther into the animal œconomy, and so, having passed the primæ viæ, discover their

* Vide Lister's journey to Paris. † *Quis tumidum guttur miratur in Alpibus?* Juvenal. satir. xiii.

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* Lib.
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VENOMOUS EXHALATIONS. 155

malignity in some of the inmost recesses. Thus the fons ruber in Æthiopia, mentioned by Pliny *, about which abundance of native minium or cinnabar was found, shewed its ill effects chiefly on the brain: and therefore Ovid † says of it,

———*Si quis faucibus hausit,*

Aut furit, aut patitur mirum gravitate soporem.

We shall not need then to enlarge on this matter; since any of the forementioned mineral poisons may thus impart their deadly quality to waters: and accordingly there are instances of arsenical, mercurial, &c. fountains, of which the histories may be seen in the collections of the learned Baccius ‡; and one very remarkable in the Philosophical Transactions ||.

But as we before took notice concerning airs, so it may be worth the while to observe of waters, that there are some alterations of them, which though not properly poisonous, yet are of so great consequence in their effects, that they may very well deserve to be regarded.

This I shall do with respect to a great abuse committed in this kind about the city; and that is, in chusing sometimes stagnating impure well-water for the brewing of beer, and making other drinks. Such a fluid indeed has oftentimes a greater force and aptness to extract the tincture out of malt, than is to be had in the more innocent and soft liquor of rivers: but for this very reason it ought not, unless upon mere necessity, to be made use of; this quality being owing to the mineral particles and aluminous salts with which it is impregnated.

* Lib. xxxi. c. 2. † Metamorph. lib. xv. ver. 320. ‡ De therm. lib. vi. || Number 8.

A late author *, by searching into the first accounts of the distemper we call the scurvy, described by Pliny †, and Strabo ‡, under the promiscuous names of *stomacace* and *scelotyrbe*; and examining the authentic histories of it in later years, made by the most observing physicians in those countries where it was unhappily revived, as Olaus Magnus, Balduinus Ronseus, J. Wierus, Solomon Albertus, &c. finds that the origin of it was in all times and places charged upon the use of unwholesome stagnating waters. Then by comparing together the clayey strata of the earth about the cities of London, Paris, and Amsterdam, he shews, that where the water is worst, there this malady is most rife. So that he has put it out of all doubt, that most of the perplexed and complicated symptoms, which are ranged under this one general name, are in a great degree owing to the ill qualities of this element.

And indeed Hippocrates himself, as he has very plainly decyphered this disease ||, by the title of *σπλινες μεγάλοι*, or great spleens; so he does very particularly in another treatise † take notice, that drinking of stagnating well-waters must necessarily induce an ill disposition both of the spleen and belly.

If we inquire into the reason of such ill effects, we must consider, that clay is a mineral glebe, and that the gross particles and metallic salts with which waters passing through such a bottom abound, are, as Dr Lister observes, not to be mastered; that

* Dr J. H. *scelera aquarum*; or, A supplement to Mr Graunt on the bills of mortality. † Lib. xxv. c. 3.
 ‡ Geogr. lib. vi. || Prorrh. lib. ii. c. 16. † De
aëre, aquis, et locis, sub finem.

is, indigestible in the human body *. Not only therefore will these cause, as he very well argues, calculous concretions in the kidneys, bladder, and joints, and, as Hippocrates experienced, hard swellings in the spleen ; but they must necessarily oftentimes by their corrosive quality twitch and irritate the sensible membranes of the stomach and bowels, and thus hinder and interrupt the digestion of our food. Nay, besides all this, when they come into the blood, it is no wonder, if the small canals of insensible perspiration are frequently stopt and obstructed by them : for it is upon this score that Sanctorius † teaches us, “ that heavy water converts the matter of transpiration into an ichor, which being retained induces a “ cachexy.”

What mischiefs will ensue hereupon, every one sees; not only pains in the limbs, livid spots in the surface of the body, ulcers, &c. from the acrimony of the undischarged moisture; but many besides of those nervous complaints, which go by the name of *hysterical* and *hypochondriacal*, may take their rise from the same source : for the before-cited Sanctorius ‡ has remarked, that the flatus or wind, so inseparable from those cases, is no other than “ the fluid “ of perspiration rude and unfinished.”

If these inconveniencies are oftentimes not felt, at least not till towards the declining age, in strong and active habits of body ; yet I am, from very good experience, assured, that they deserve consideration

* De fontib. med. Angl. p. 2. pag. 75. At fossilia si-
ve metallica salia alia atque alia sunt, et nobis et pene
igni dixeram indomabilia.

† Medic. Static. § ii.
aphor. 6. ‡ Ibid. § 3. aph. 13. Flatus nihil aliud est
quam rude perspirabile.

in weaker constitutions, and a sedentary life, especially of the more tender sex.

For these reasons Pliny * tells us, "that those waters are condemned in the first place, which, when boiled, incrustate the sides of the vessels." And that our well-waters do this, nobody who looks into the common tea-kettles, can be ignorant.

And indeed, in ancient times, as that part of medicine which relates to diet, was more carefully studied, than it is now; so this point particularly, of which we are treating, was of so great moment, that Hippocrates, who wrote the best book † on the subject that ever was published, has in a great measure accounted not only for the diseases, but even for the temper and disposition of the people of several countries, from the difference of their airs and waters.

* Lib. xxxi. c. 3. *Damnatur imprimis fontes, quorum aquæ decoctæ crassis obducunt vasa crustis.* † *De aëre, aquis, et locis.*

Explication of figures not explained in the treatise.

TABLE III. The Scolopendra. Fig. 1. *aa.* The claws of the poisoning forceps.

Fig. 2. One of the claws magnified, in which appears the aperture *b.*

Fig. 3. The Scorpion. *aa.* The claws. *b.* The tail with the sting at the end.

Fig. 4. The sting magnified, to shew one of the slits, out of which issues the poison *a.*

Fig. 5. The Tarantula. *aa.* The wounding forceps. *bb.* The feelers.

TABLE IV. Fig. 1. The upper part of an expanded leaf of the lichen. *aa.* The peltæ or seminal capsulæ, at the extremities of the leaves.

Fig. 2. The under-side of the same leaf, with the peltæ.

Fig. 3. A view of a leaf, as it lies on the ground unexpanded.



Fig. 1.

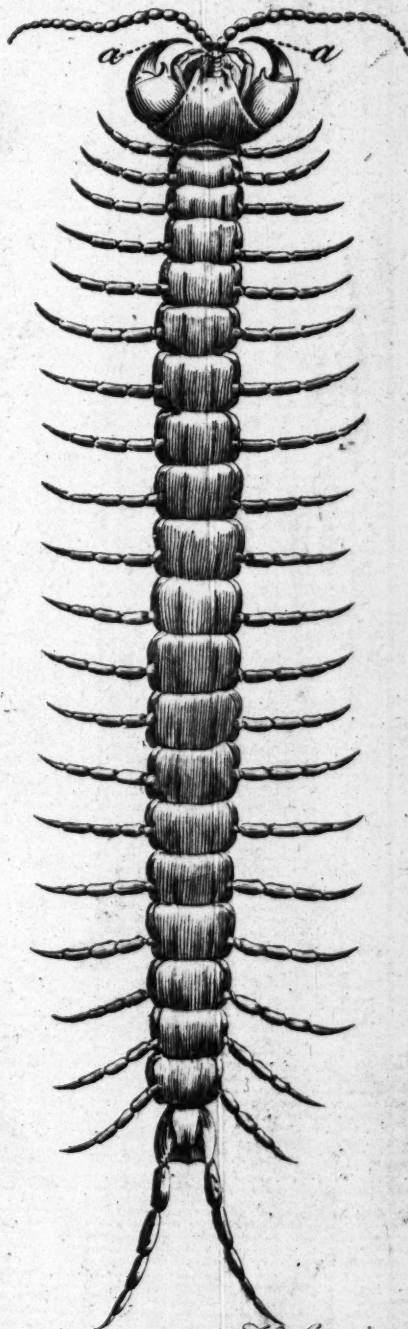


Fig. 3.

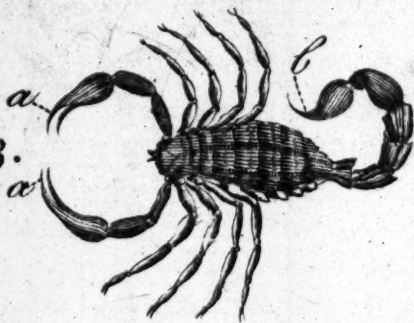


Fig. 2.



Fig. 5.

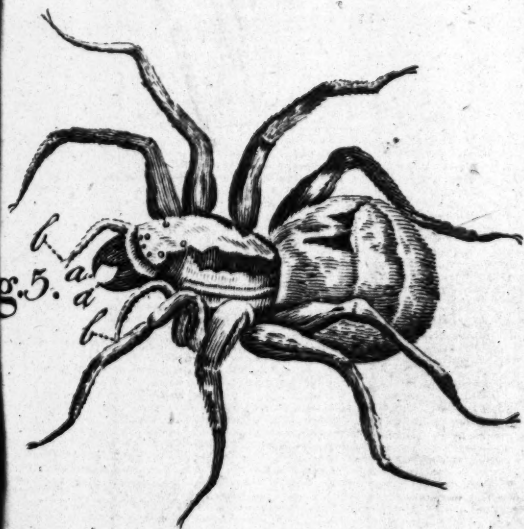


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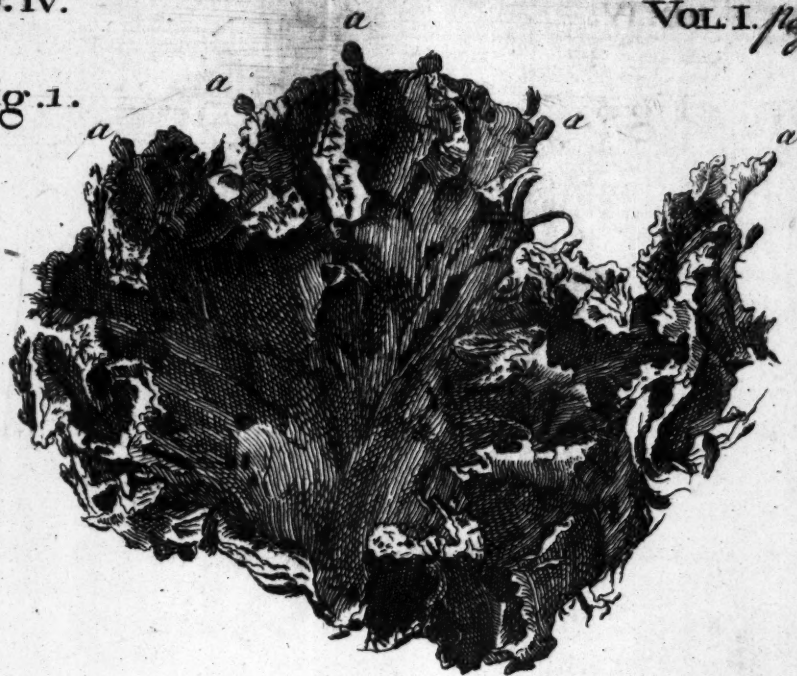


Fig. 3.

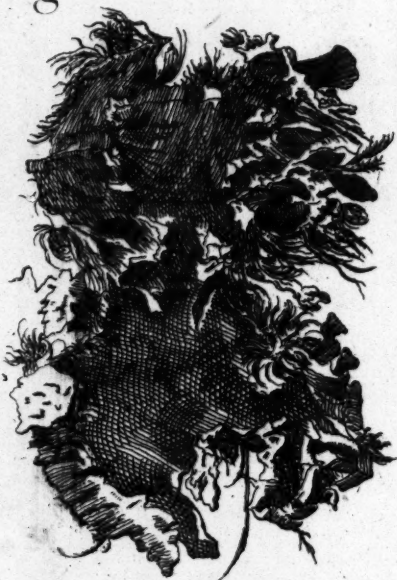
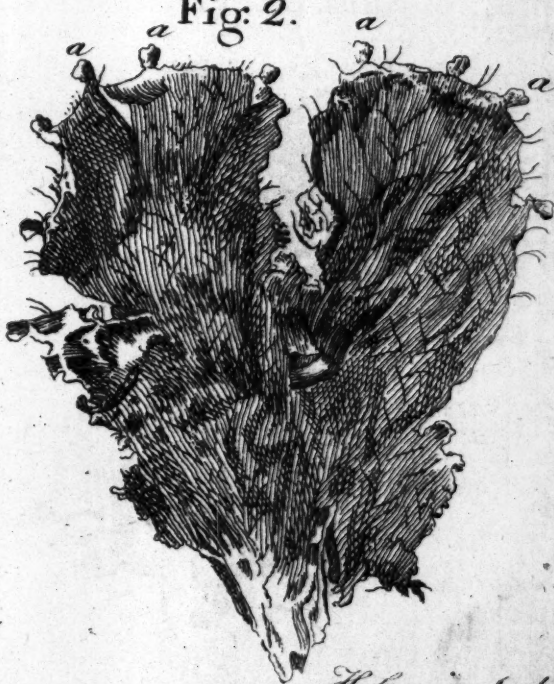


Fig. 2.



H. Gavin Sculp.

A TREATISE concerning the INFLU-
ENCE of the SUN and MOON
upon HUMAN BODIES, and the
DISEASES thereby produced.

A D V E R T I S E M E N T.

HAVING resolved, at the instance of some friends, to give a second edition of this small treatise, I thought it incumbent on me, to read it over attentively ; in order to make such additions and improvements, as above forty years experience might have suggested to me since its first publication. Accordingly, in this review, I have explained some mathematical matters in a clearer manner than I had formerly done ; and I have illustrated and confirmed the medicinal part by several additional observations and cases, which may prove useful in the practice of physic. And indeed, that a due consideration of this subject is extensively useful to a physician, will appear with sufficient evidence, from the various kinds of diseases, the courses and returns of which I have herein shewn to depend on the different positions and revolutions of the sun and moon. Now, though a previous acquaintance with the mathematical principles of natural philosophy be requisite for comprehending this subject in its full extent ; yet as those who are little affected by geometrical demonstrations, may possibly be convinced by a number of facts, I shall

shall not, with respect to this little work, insist on that saying of Plato :

ΟΥΔΕΙΣ ΑΓΕΩΜΕΤΡΗΤΟΣ ΕΙΣΙΤΩ.

Let none unskilled in geometry enter here.

London, July 1. 1746.

P R E F A C E.

AS the study of physick has in all ages undergone various changes, according to the different opinions of philosophers ; I have often wondered, how it comes to pass, that notwithstanding the considerable advances made in the study of nature by the moderns, especially in the last century, this useful art has not received those benefits, which might reasonably be expected from a surer method of reasoning, than men were formerly acquainted with. That some of the moderns, particularly Galilei, Kepler, Torricelli, and Sir Isaac Newton, have made vast improvements in natural philosophy, by joining mathematical reasonings to their inquiries into nature, is well known to the learned world : and yet medicine still deals so much in conjecture, that it hardly deserves the name of a science. Whether this be owing to the nature of the art, as being incapable of sure principles ; or rather, to the artists, who having got into a wrong track, will not take the pains to return into the right road ; may possibly be a matter of inquiry on some other occasion. In the mean time, in order to prove how beneficial the study of geometry must be to physicians, as well for investigating the causes of diseases,

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as for finding proper remedies for them ; I have attempted to explain a very difficult question, concerning the courses and returns of some distempers ; the nature of which is such, that it cannot be thoroughly well handled by any other means.

Thus I am necessitated, in this disquisition, to enter into a few more minute calculations, than a medical subject might seem to require. Wherefore the reader ought to have some knowledge of Sir Isaac Newton's philosophy ; or, at least, understand the learned and sagacious Dr Halley's theory of the tides, upon the principles of that great philosopher, as published in the Philosophical Transactions. And those who have no taste for mathematical studies, may, if they please, pass over this part of the work. For my part, I never expect to acquire reputation by algebraical calculations, thoroughly sensible of the mediocrity of my genius in that branch of learning. But I flatter myself, that these sheets will be found to contain some histories and instructions, from which even those who despise all reasoning in physick, and rely on experience alone, will reap benefit in practice : which indeed is the main design of this little treatise.

The field is large, in which we run our career ; nor are the innumerable evils, with which we are daily surrounded, to be remedied by any one method. The two great pillars of medicine are experience and reason ; and he that has no confidence in the latter, at least bids the fairer towards relieving the sick, in proportion to his stock of the former. But yet the business of our profession requires the joint assistance of both ; because a rational theory will teach a man

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to apply his experimental knowledge to the various cases that occur.

For although a very few remedies, found out by chance, and confirmed by use, might possibly have been sufficient for curing the disorders of men in the earliest times, who, we are told, led sober and active lives; yet in succeeding ages, when their constitutions had been injured by sloth and luxury, they stood in need of different methods of cure; inasmuch as it now became necessary to inquire, not only into the cause of the distemper, but also how its nature and usual appearance had been changed in this or that individual. Hence that saying of Hippocrates *: The physician should have an eye to things common and peculiar: because, as Celsus rightly observes, there are cases, in which the same disorder puts on a different appearance from that which it usually has; and the discovery of the cause is sometimes the cure of the distemper †.

And it is probable that the only reason why the profession of physic lay buried in total darkness for near five hundred years, that is, from the Trojan to the Peloponnesian war, as Pliny has recorded ‡, was, that, whereas new diseases started up from time to time, and those who had nothing but experience to make them physicians, were unequal to these new difficulties; the philosophers ingrossed the art, which was found to be lame and infirm without the knowledge of nature. Thus Celsus says of that space of time, that the science of physic was accounted a part of philosophy; so that the curing of diseases, and the

* Epidem. lib. i.
xxix. in præcæm.

† In præfat.

‡ Lib.

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VOL. I

contemplation of nature, took their rise from the same persons *.

Now, as it is of consequence to the subject in hand, so it is easy to prove, that those philosophers who laid the first foundations of our art, were really famous geometricians. And first, the most eminent among the sages of antiquity was Pythagoras, who had acquired such high reputation for his skill in physic, that it was commonly said, that he travelled, not so much for the sake of instructing people, as of curing them †. But the progress made by him in mathematical studies also was extraordinary. Witness his two noble discoveries: the one, of the square described upon the side subtending the right angle in a right-angled triangle, being equal to both the squares described upon the sides containing the right angle; the other, of the area of the parabola, which, according to Proclus ‡, he first demonstrated. For the first of these problems, Athenæus || and Diogenes Laertius †, upon the authority of Apollodorus the arithmetician, say, that he offered a hecatomb in sacrifice. But Plutarch ‡, after citing a verse of Apollodorus, leaves it doubtful for which of the two he made that offering.

Empedocles was his disciple in Italy, a person of a vast genius, who, having penetrated into nature's inmost recesses, performed such great things in our profession, as were not to be expected from a bare experimental knowledge of physic. For when his native

* Loco citato. † Ælian. var. hist. lib. iv. cap. 17.

† Lib. iv. ad primum Euclid. || Lib. x. p. 418.

‡ In vita Pythagoræ, lib. viii. segm. 12. → Quod ne vivere jucunde quisquam possit, qui sectam sequatur Epicuri.

city Agrigentum was infected with a dreadful plague, he soon found out the cause; and thereupon by stopping up some openings in the mountains, through which unwholesome winds issuing brought the contagion, he averted the evil*. He rendered the same service to the Selinuntians: for when they were seized with a plague from the corruption and stench of the stagnating waters of a river, which surrounded the city; he ordered two neighbouring rivers to be conveyed into it: by which means, having made a current, and cleansed the channel, the waters gradually grew sweet, and the plague ceased †. Now, these facts are the more worthy of being recorded; because the ancients were generally of opinion, that pestilence proceeded from the anger of the gods, and therefore was not to be cured by natural remedies; whereas, in both these cases, the remedies were pointed out by mechanical reasoning; and that calamities of this kind are owing to such causes, is confirmed by a great number of observations published by various authors.

Democritus, who is thought by some to have been Hippocrates's master, was equally famous for geometry and physic. For he is said to have written, among other things, Of the contact of the circle and sphere; Of geometry; Of incommensurable lines; as also, Of the nature of man; Of the humours; and, Of plagues ‡.

By those great men, and others like them, was this profession carried on to the time of Hippocrates;

* Idem, de curiositate, & lib. contra Coloten.

† Vid. Diog. Laert. lib. viii. segm. 70.

‡ Idem, in vita Democriti, lib. ix. segm. 46. & 47.

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who, as Celsus says, was the first that separated this art from philosophy *. For he, plainly perceiving, that the superstition of the common people, the impudence and vain pretences of quacks, and the pride and vanity of the sophists, were mighty obstacles to the improvement of the art, proposed to himself in all his writings to guard against those impediments and difficulties. And accordingly, in his valuable book *De morbo sacro*, he teaches how to obviate false religious notions; and is very copious in detecting the frauds and fallacies of those men who covered their ignorance with a veil of piety, making profession of charming away those diseases which they could not cure by medicines. In his books *De arte*, *De decoro*, *De præceptionibus*, he disputes not only against those who denied that physic was an art, and therefore had no regard to any thing but experience; but also against those who practised upon a wrong plan. And because the divine old man is made a tool by contending parties for their respective notions, I cannot avoid observing, that mechanical reasoning is every where approved and recommended in those treatises by that great parent of medicine. For he says, I praise reasoning, when it is grounded on such principles as fall under our senses, or are proved by experiments; and draws conclusions from manifest premisses. But if it is carried on by unjust deductions, and is built upon fictitious opinions, it occasions great trouble and difficulties †. And this sentiment is illustrated and confirmed in his book *De prisca medicina*; where after saying, that most physicians are very like unskilful pilots, whose ignorance of their art is not discovered,

* In præfatione.

† Lib. de præcept.

while the vessels sail in good weather before the wind ; but if a storm arise, then it soon appears, that their blunders were the cause of the shipwrecks which happen ; he tells us, that our chief care should be to learn the properties of things, not by imagining or contriving, but by finding out the powers which they are endowed with, and exercise on our bodies ; in which inquiry great regard must be paid both to the qualities of the humours, and to the figures of the parts : some of which from a wide beginning run into a narrow apex, others are more and more expanded ; some are smooth and cylindrical ; some dense or firm, others, in fine, thin and lax. This is the wisdom which ought to accompany the study of medicine ; by means of which, he says, the artist becomes equal to the gods *.

But I shall enlarge no farther at present on this theme. However, it manifestly appears from what has been hitherto said, that Hippocrates gave the name of *Sophists* † to those who argued on fictitious principles ; and that of real physicians ‡ to those who reason from the laws of nature, and a knowledge of the animal fabric. Which I observe for the sake of those, who, as if there was no difference between the groundless hypotheses of philosophers, and the certain conclusions of geometricians, hold this most useful science in contempt, and even turn it into ridicule before the ignorant multitude. But surely these apply themselves both to philosophy and physic, without having any genius to either ; for want of which they cannot discern the wide distance between sophistical opinions and geometrical reasonings. For he who

* Lib. de decoro.

† Σοφιστὰς.

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builds an hypothesis, follows plausibility, and thinks it sufficient, if he can account for appearances from his principles : whereas mechanical theory deals in demonstrations, which the able geometrician deduces either from the figures of bodies, or from the known laws of motion, by necessary consequences.

Examples will set this matter in a clearer light. Des Cartes compiled a set of suspicions and conjectures on the gravity of bodies, and yet made no proficiency thereby in the knowledge of nature : but Sir Isaac Newton, by pursuing its laws in a geometrical manner, without any regard to the cause, laid open to our contemplation the real fabric of the world. Dr Willis invented an idea of soporiferous diseases ; from which we learn, that the author had words at will, but knew nothing of the nature of those diseases : whereas Bellini, by bringing their history and symptoms under mechanical reasonings, paved the way to the knowledge and cure of those great evils. But enough of this subject.

When I had communicated my intention of publishing this piece to my friend the celebrated Dr Pitcairne, he not only applauded my design, but, of his great humanity, readily sent me some histories of periodical diseases out of his large stock. Those I have ranged in their proper places, as considerable ornaments to my little book, not without a sense of pleasure, in seeing my opinion confirmed by the testimony of so great a master in these studies ; and the rather, because it was proper to produce the observations of others, as well as my own, in support of this new theory. And I may not conceal in this place, that our dissertation displays, not a little, the wisdom,
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goodness, and wonderful contrivance of the omnipotent Creator of the world; who, while he made ample provision for all living things, established this difference between brutes and rational creatures; that whereas those enjoy the common gifts of nature, he has permitted us, besides, to investigate their properties and uses, and to contemplate the labyrinth of his divine works.

Lastly, I have but lightly touched upon the cure of the cases related in this treatise; because I intend, whenever I find sufficient leisure, to publish the most remarkable observations, which I have already, or may hereafter make on most diseases.

London, 1704.

A TREATISE concerning the INFLUENCE of the SUN and MOON upon HUMAN BODIES, &c.

C H A P. I.

That the sun and moon cause various alterations in the human body, according to their different positions with respect to the earth.

IT was the general opinion of the ancient physicians, that some diseases are entirely owing to the influence of the celestial bodies, and that the paroxysms and periods of others are regulated by the action of the moon in particular: wherefore the earliest histories of epidemics, which have been handed down to us, are full of the motions and powers

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powers of those luminous orbs. Upon this principle it is, that Hippocrates advises his son Thessalus to the study of numbers and geometry *: because, says he, the rising and setting of the stars have a great effect on distempers †.

But when in course of time medicine began to be accommodated to the reasonings of philosophers; nobody being able to account for the manner of this celestial action, and the rule of observation being gradually laid aside, it was allowed no farther share in affecting our health, than what might be imputed to the changes in the manifest constitution of the air: excepting perhaps something of truth, which still remains disguised and blended with the jargon of judicial astrology.

In order therefore to set this obscure and difficult matter in a little clearer light, I shall, in the first place, endeavour to shew, that the sun and moon, regarding their nearness and direction to the earth only, besides the effects of heat, moisture, &c. thereby caused in our atmosphere, must at certain times make some alterations in animal bodies; then enumerate some histories and observations of such changes, and inquire of what use such thoughts as these may be in the practice of physic.

It is a constant observation of those who have written the history of the winds, that the most windy seasons of the year are the times about the vernal and autumnal equinox. Every body likewise knows, that in the most quiet weather there is generally some breeze at mid-day, and midnight, as also at full sea; that is, always about the time when the sun or moon

* Epist. ad Thessalum. † De aëre, aquis, et locis.
arrives

arrives at the meridian, either over or under our hemisphere. Seamen and country-people reckon upon this, and order their affairs accordingly. And the changes of the weather, as to winds or calms, especially about the new and full moon, are too well known to require any authority to confirm such remarks. Those who desire a fuller account of these observations, may see it in J. Goad's *Astronometeorologia* *. These things being matters of fact, and in a manner regular and universal, it may very well seem strange, that philosophers have not been more accurate in their inquiries into the reason of such appearances. True indeed it is, that the origin of winds is various and uncertain; but however, so constant and uniform an effect must undoubtedly be owing to one necessary cause.

It has been, now a considerable time since, sufficiently made out, that our atmosphere is a thin elastic fluid, one part of which gravitates upon another, and whose pressure is communicated every way in a sphere to any given part thereof. From hence it follows, that if by any external cause the gravity of any one part should be diminished, the more heavy air would rush in from all sides around this part, to restore the equilibrium, which must of necessity be preserved in all fluids. Now, this violent running in of the heavier air would certainly produce a wind, which is no more than a strong motion of the air in some determined direction. If therefore we can find any general cause, that would, at these stated seasons, which we have mentioned, diminish the weight or pressure of the atmosphere; we shall have the genuine

* London, 1690. 4to.

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reason of these periodical winds, and the necessary consequences thereof.

The flux and reflux of the sea was a phenomenon too visible, too regular, and too much conducing to the subsistence of mankind, and all other animals, to be neglected by those who applied themselves to the study of nature: however, all their attempts to explain this admirable contrivance of infinite wisdom were unsuccessful, till Sir Isaac Newton revealed to the world juster principles; and, by a truer philosophy than was formerly known, shewed us how, by the united or divided forces of the sun and moon, which are increased and lessened by several circumstances, all the varieties of the tides are to be accounted for. And since all the changes we have enumerated in the atmosphere, do fall out at the same times when those happen in the ocean; and likewise whereas both the waters of the sea, and the air of our earth, are fluids subject, in a great measure, to the same laws of motion; it is plain, that the rule of our great philosopher takes place here, viz. that natural effects of the same kind are to be attributed, as much as possible, to the same causes *.

What difference that known property of the air, which is not in water, makes in the case, I shall shew anon. Setting aside the consideration of that for the present, it is certain, that as the sea is, so must our air, twice every twenty-five hours, be raised upwards, to a considerable height, by the attraction of the moon coming to the meridian; so that instead of a spherical, it must form itself into a spheroidal figure, whose longest diameter, being produced, would pass through the moon. That the like raising

* Newton. princip. pag. 387.

must follow, as soon as the sun is in the meridian of any place, either above or below the horizon; and that the moon's power of producing this effect exceeds that of the sun, in the proportion of $4\frac{1}{2}$ to 1 nearly. Moreover, that this elevation is greatest upon the new and full moons, because both sun and moon do then conspire in their attraction; least on the quarters, in that they then drawing different ways, it is only the difference of their actions that produces the effect: lastly, that this intumescence will be of a middle degree, at the time between the quarters, and new and full moon. The different distances of the moon in her perigæum and apogæum, likewise increase or diminish this power. Besides, the sun's lesser distance from the earth in winter is the reason, that the greatest and least attraction of the air upwards more frequently happens a little before the vernal, and after the autumnal equinox. And in places where the moon declines from the equator, the attraction is greater and lesser alternately, on account of the diurnal rotation of the earth on its axis.

Whatever has been said on this head, is no more than applying, what Sir Isaac Newton has demonstrated of the sea, to our atmosphere: and it is needless to shew, how necessarily those appearances, just now mentioned of winds, at the stated times, must happen hereupon. It will be of more use to consider the proportion of the forces of the two luminaries upon the air, to that which they have upon the waters of our globe; that it may the more plainly appear, what influence the alterations hereby made must have upon the animal body.

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prop. 37.

Sir Isaac Newton has demonstrated *, that the force of the sun to move the sea, is to the force of gravity, as 1 to 12868200. Let this be

$$S : G :: 1 : n. \text{ Hence, } S = \frac{G}{n}.$$

And that the force of the moon to raise the sea is to gravity, as 1 to 2871400. Let this be

$$L : G :: 1 : s. \text{ Hence, } L = \frac{G}{s}.$$

And since the centrifugal force of the parts of the earth, arising from its diurnal motion, is to gravity, as 1 to 289; let this be

$$C : G :: 1 : e. \text{ Then } C = \frac{G}{e}.$$

Hence,

$$S + L : C :: \frac{G}{n} + \frac{G}{s} : \frac{G}{e} :: \frac{1}{n} + \frac{1}{s} : \frac{1}{e} ::$$

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The same philosopher has taught us, that the centrifugal force raises the water at the equator above the water at the poles, to the height of 85472 feet †. Wherefore if that force, which is as 8123, raises the ocean to 85472 feet; the united forces of the sun and moon, which are as 1, will raise the same to 10½ feet :

* Princip. lib. iii. prop. 36. & 37. † Ibid. lib. iii. prop. 37.

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Now, we know that the more easily the water can obey the attraction, with the more force are the tides moved: but since, as the sagacious Dr Halley has determined it, our atmosphere is extended to forty-four miles, whereas the middle depth of the ocean is but about half a mile; it is plain, that the air, revolving in a sphere about a hundred times larger than that of the ocean, even supposing the whole terrestrial globe covered with water, will have a proportionably greater agitation. Besides, rocks, shelves, and the inequality of shores are a great stop to the access and recess of the sea: but nothing repels the rising air, which is also of such thinness and fluidity, that it is easily driven, and runs every way.

Nor ought we to omit, that it is the universal law of bodies attracted, that the force of attraction is reciprocally as the squares of their distances; so that the action of the sun and moon will be greater upon the air, than upon the water, upon the account of its nearness. But the consideration of the elasticity is still of greater moment here; of which this is the nature, that it is reciprocally as the pressure: so that the incumbent weight being diminished by the attraction, the air underneath will upon this score be mightily expanded. True it is indeed, that this pressure diminishes gradually, in such sort, that it is of no moment beyond a certain distance from the earth: but yet a small alteration therein produces a very considerable effect; because thereby our ambient air the more readily yields to the attractive faculty.

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VOL. I.

These and such like causes will make the tides in the air from the moon's attraction, to be much greater than those of the ocean. Nor is it necessary to our purpose to determine, by nice calculations, their particular forces : it is sufficient to have proved, that these motions must both be universal, and also return at certain intervals.

Now, since the raising of the water of the ocean to ten feet and a half, produces torrents of such a prodigious force ; we may easily conceive what tempests of winds, if not otherwise checked, the elevation of the air much higher, perhaps above a mile, will necessarily cause. And there is no doubt to be made, but that the same infinitely wise Being, who contrived the flux and reflux of the sea, to secure that vast collection of waters from stagnation and corruption, which would inevitably destroy all the animals and vegetables on this globe, has ordered this ebb and flood of the air of our atmosphere, with the like good design ; that is, to preserve the sweet freshness, and brisk temper of this fluid, so necessary to life ; and keep it, by a kind of continual circulation, from deadness and stinking. We daily feel the benefits of this wonderful contrivance ; but I cannot find that the manner of it has been hitherto accounted for. And yet no subject better deserved the serious consideration of physicians : since it has been observed, that people recover speedily from wasting chronical diseases in clear open air ; and that the best constitutions are very liable to sickness in moist close places.

This reasoning is liable to only one objection, that I know of, which is this : That the appearances we have mentioned, cannot be owing to the causes now

assigned ; since, by calculation from them, the mercury must at new and full moon subside in the barometer to a certain degree ; which yet barometrical writers do not observe to happen. Ramazzini in particular expresses his surprise on this head, thinking it reasonable to suppose, that as the tides in the ocean are observed to be greater at those times, than at any other time of the moon, on account of the influence which this planet is thought to have on the sea ; so likewise some remarkable change ought to appear in the gravity of the atmosphere. But yet, says he, nothing of this kind has happened, worth mentioning ; for through the whole course of this year there was little or no difference in the height of the mercury at the new and full moons, with respect to the preceding and subsequent days ; nor indeed during all the times of its darkness*.

In answer to which, it may not be amiss to inquire into the cause of the rise and fall of the quicksilver in the barometer, which does not seem to have been cleared up by writers on this subject. First, then, it is certain, that this heavy fluid is raised by the pressure of the incumbent air, and that the pressure of this element is in proportion to its gravity : which as it is the greater, the more air is contained in the column directly impending on the quicksilver ; whatsoever increases or diminishes this quantity of air, will make the quicksilver rise or fall in the tube. Hence it is, that winds occasion very considerable changes in the weather-glass ; according as they rarefy or condense the air in this column. Thus between the tropics, where the trade-winds reign, which are mo-

* Ephemerid. baromet. Mutinens. an. 1694. p. 19.
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derate gales, constantly blowing from the same quarter for several months together, the variations of the barometer are very inconsiderable, as Dr Halley has observed *; whereas in northern latitudes they are considerable, and indeed more so than in southern latitudes: because storms are more common in the former, than in the latter; and at those times which are most subject to winds, the mercury varies almost every hour: as Rammazzini has observed about the equinoxes. For about these, he says, I have observed remarkable variations, and especially at the autumnal equinox, when the quicksilver rose and fell several lines in one day; whereas in the solstices it kept the same station as in the foregoing days †. But yet, let the air be raised ever so high at the new and full moon, it cannot possibly happen, that the mercury should constantly subside in all places at those times: because such is the known property of winds, that those which carry off and rarefy the air in one place, croud it in, and condense it in another.

This matter thus far explained, it will not be improper to subjoin the solution of a difficult question, which has raised great contention among philosophers; viz. whereas water is more than eight hundred times heavier than air, how does it happen, that the latter, when replete with watery vapours, depresses the mercury in the barometer, so that its fall is an indication of rain? Now, this phenomenon seems to me to be chiefly owing to the following causes. Water is so entirely void of elasticity, that no force can compress it into a narrower compass; and at the same time, a boiling heat divides it into such minute particles, as

* Phil. Transf. N^o 181. p. 111. † Lib. citat. p. 20.

to make it occupy fourteen thousand times more space, than it naturally takes up *. This vapour, more than sixteen times thinner than our air, is so subtile, that it is easily retained by the particles of the air, and unites with them, much in the same manner, as the very small parts of metals, dissolved in some acid liquors, are suspended by them. For it is well known, that the more minutely bodies are divided, the more surface they acquire in respect to their bulk. Besides, the air, which we breathe, contains a vast number of particles heavier than water, I mean the exhalations from minerals, animals, and vegetables, and, in a word, from all the productions of the earth. But perhaps what is of greatest moment in this case, is the quality of the particles exhaled from the earth, which are chiefly sulphureous. For it has been found by experiments, that the fumes from sulphur are so contrary to elasticity, that they quite destroy it †. Now, Sir Isaac Newton has shewn, that almost all bodies contain sulphur: and the phænomena of lightning and thunder shew, that the atmosphere is full of it. Wherefore these reasons sufficiently prove, that moist air has less power to act than dry air. When these very subtile watery vapours, by their attractive and repulsive qualities, have run into one another, and formed drops; they thereby become heavier than air, and fall to the earth in the form of rain; and then the air, freed from these vapours, acts with greater force, and raises the mercury in the barometer.

But to return: The winds are produced by so

* See Defaguliers's course of experimental philosophy, vol. ii. lect. x.
 † See Hales's statical essays, vol. i. p. 230. and 299.

many different causes, that a person would find himself greatly mistaken, who would attempt to account for them all upon any one principle.

Wherefore to those already explained, we may add that constant cause of the motion of the air, I mean the heat of the sun. For as Dr Halley * has demonstrated, that the trade-winds, which reign between the tropics, owe their rise to it; so it is most certain, that it may occasion various motions of the air in every part of the terraqueous globe. Moreover, we know that there sometimes happen violent tempests in the upper regions of the air, while we enjoy a calm below; and that the ridges of mountains check the propagation of the winds in many places: so that it is no wonder, that the phænomena of the changes of the air, which we have ascribed to the action of the moon, are not always constant and uniform. Now, the chief causes of uncertain and irregular winds are these. First, elastic vapours forced from the bowels of the earth, by subterraneous heats, and condensed by what cause soever in the atmosphere. Secondly, a mixture of effluvia of different qualities in the air, may, by rarefactions and fermentations, produce winds, and other effects, like those resulting from the combination of some chemical liquors. And that such things happen, we are assured from the nature of thunder, lightning, and meteors. Thirdly, from the eruptions of volcanoes, and earthquakes in distant places, winds may be propagated to remoter countries. Lastly, the divided or united forces of the other planets, and of

* Phil. Transact. N^o 183.

comets, may variously disturb the action of the sun and moon.

These things being premised, it will not be difficult to shew, that these changes in our atmosphere at high water, new and full moon, the equinoxes, &c. must occasion some alterations in all animal bodies; and that from the following considerations.

First, all living creatures require air of a determined gravity, to perform respiration easily, and with advantage: for it is by its weight chiefly, that this fluid insinuates itself into the lungs. Now, the gravity, as we have proved, being lessened at these seasons, a smaller quantity than usual will insinuate itself; and this must be of smaller force to comminute the blood, and forward its passage into the left ventricle of the heart: whence a slower circulation ensues, and the secretion of the nervous fluid is diminished.

Secondly, this effect will be the more sure, in that the elasticity of the atmosphere is likewise diminished. Air proper for respiration must be, not only heavy, but also elastic, to a certain degree: for as this is by its weight forced into the cavity of the thorax in inspiration, so the muscles of the thorax and abdomen press it into the most minute ramifications of the bronchia in expiration: where the bending force being somewhat taken off, and springy bodies, when unbended, exerting their power every way, in proportion to their pressures; the parts of the air push against all the sides of the vesiculæ, and promote the passage of the blood. Therefore the same things, which cause any alterations in this property of the air, will more or less disturb the animal motions.

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We have a convincing instance of all this, in those who go to the top of high mountains: for the air is there so pure (as they call it), that is, thin, and wants so much of its gravity and elasticity, that they cannot take in a sufficient quantity of it to inflate the lungs, and therefore breathe with very great difficulty.

Lastly, all the fluids in animals have in them a mixture of elastic aura, which, when set at liberty, shews its energy, and causes those intestine motions we observe in the blood and spirits; the excess of which is checked by the external ambient air, while those juices are contained in their proper vessels. Now, when the pressure of the atmosphere upon the surface of our body is diminished, the inward air in the vessels must necessarily be enabled to exert its force, in proportion to the lessening of the gravity and elasticity of the outward: hereupon the juices begin to ferment, change the union and cohesion of their parts, and stretch the vessels to such a degree, as sometimes to burst the smallest of them. This is very plain in living creatures put into the receiver, exhausted by the air-pump; which always first pant for breath, and then swell, as the air is more and more drawn out: their lungs at the same time contracting themselves, and falling so together, as to be hardly discernible, especially in the lesser animals*.

Concerning the weight of the atmosphere on a human body, and its difference of pressure at different times, let this estimate suffice. We will lay it down as certain, that this weight and pressure may be computed from the force with which the air raises the

* *Esperienze dell'academia del cimento*, p. 118.

quicksilver in the barometer. The surface of a man's body, of a middle size, is fifteen square feet, or 2160 inches. The weight of a cubic inch of quicksilver is 8, 101, &c. ounces Avoirdupois. Wherefore the pressure of the air on every square inch of the human body, in the ratio of the weight of the quicksilver in the barometer, will stand thus. A column of quicksilver, an inch square, can in England be raised in the barometer to 30 inches and $\frac{1}{8}$, by the air when heaviest; and it will subside to 28 inches, when the air is lightest. Consequently, the air, when heaviest, will press on every inch of the surface of the human body, with the weight of 15 pounds and 9 ounces; when lightest, with that of 14 pounds 2 ounces Avoirdupois. Thus the whole body, in the heaviest air, sustains a weight of about 33684 pounds; in the lightest, of 30622 pounds 5 ounces. Whence the difference of pressure at different times is 3062 pounds nearly. True it is, that the internal air of the human body makes a resistance to that weight: but yet such change of pressure must necessarily have considerable effects; especially when this internal air, through some defect in the animal fluids, with which it is mixed, is increased or diminished in its natural properties.

Before we proceed to other matters, it may be worth the while to take notice of two things: first, that effects depending on such causes as these, must of necessity be most visible in weak bodies, and morbid constitutions, when other circumstances concur to their taking place: while strong bodies and sound constitutions are little affected by them. For this reason, whatever mischiefs do hence follow, cannot in the

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the least disparage the wise contrivance of infinite power, in ordering these tides of our atmosphere. The author of nature has certainly made all things to the greatest advantage that could be, for the whole system of animals on our globe, although such a disposition might in some cases prove prejudicial to a few. The position and distance of the sun are so adjusted, as to give, in the most beneficial manner possible, heat and light to the earth: yet this, notwithstanding the excessive summer-heats in some countries, may be attended with bad consequences; in others, the winter-colds may be so intense, that tender bodies cannot bear them; and in all seasons and climates, changes of weather may give birth to diseases. The whole, however, we must own, is most carefully provided for. Besides, as most of these last mentioned inconveniencies are by easy shifts to be avoided; so there are such powerful checks put to this æreal flux and reflux, so many ways of abating the damages accruing from it now and then; that these are of no account in comparison of the mighty benefits hence arising, in which the race of mankind does universally share.

Secondly, that the other planets have likewise their peculiar influences; which, though inferior to those of the sun and moon, yet contribute various ways towards increasing or diminishing the action of these on human bodies. And these united forces are of such consequence, that violent and occult diseases, with which whole nations are seized, may be certainly attributed to them. And the *θεῖον τι*, or somewhat divine of Hippocrates *, which he recommends to have regard to in diseases, is most probably nothing

* Prognostic. 1.

more than the state of our atmosphere, occasioned by the influence of the planets, or some other uncommon and unknown natural cause; as I have more amply explained on another occasion *.

C H A P. II.

Of the diseases, and symptoms, which derive their origin from the above-mentioned causes.

I Now proceed to examine what particular functions of animal bodies are disturbed by these periodical rarefactions of the fluids in their proper vessels: and here I shall not ground my opinion on my own observation alone, but likewise take in the assistance of other medical writers. For there are no histories in physic, which we may more safely take upon the credit of the authors who relate them, than such as we are now going to mention. In some cases a point may perhaps be strained, to serve a darling hypothesis which the writer has taken up; but here we are much more likely to have pure matter of fact: because hitherto no one has pretended, that the appearances of this kind are within the reach of any scheme of philosophy.

And first it appears evident to me, that the moon's influence is necessarily greater on the nervous fluid or animal spirits, than on the blood, or any other fluid of the animal body. For as that fluid is composed of extremely minute, and (as I have shewn elsewhere †) elastic parts; it must be the more easily

* See account of poisons, essay vi. † See introduction to a mechanical account of poisons.

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susceptible of the power of any external cause whatever. Wherefore the moon's action will chiefly regard those diseases which are occasioned by the vitiation of those spirits.

Of this class none seem more remarkable than epileptic diseases, which, besides the other difficulties with which they are attended, have also this surprising, that in some the fits do constantly return every new and full moon. The moon, says Galen *, governs the periods of epileptic cases. Upon this score, they who were thus affected, were by the Greek writers sometimes called Σεληνιακοὶ †, and in the histories of the gospel Σεληνιαζόμενοι ‡, and by some of the Latins afterwards, *Lunatici* ||.

And indeed, I myself remember, when I was physician to St Thomas's hospital during the time of Queen Anne's wars with France, that several of the sailors of our fleets were brought thither, and put under my care for this distemper: most of whom were new men, who had contracted the disease by frights, either in sea-engagements, or in storms. But the moon's influence was so visible on the generality of them at the new and full, that I have often predicted the times of the fits with tolerable certainty. And T. Bartholin tells a story of an epileptic girl, who had spots in her face, which varied both in colour and magnitude, according to the time of the moon. So great, says he, is the correspondence between our bodies and the heavens †.

* De diebus criticis, lib. iii. † Alexand. Trallian.
lib. i. c. 25. ‡ Matth. c. xvii. ver. 15. || Apuleius
de virtutibus herbar. cap. ix. & lxxv. † Histor. anatom.
centur. ii. hist. 72.

Moreover,

Moreover, the learned Dr Pitcairne has assured me, that he attended a patient of thirty years of age, of a thin habit and somewhat melancholic constitution of body; who, nine years before, after a considerable hæmorrhage from the nose, complained of some humour suddenly arising from his right hand to the top of his shoulder, and then fell senseless on the ground. Upon his recovery from the fit, he felt so great a numbness in that hand, that he could not stir his fingers: and his right arm was violently tossed forward and backward, against his will, for the space of four minutes; during which time he lost the use of his tongue. And this disorder returned periodically twice every year, in March and September, that is, at the new moon, near the vernal and autumnal equinoxes. The most remarkable particulars of this case were these. First, the paroxysm came on more frequently in the night than in the day-time. Secondly, neither his feet nor left arm were ever affected by the disorder. Thirdly, the stupor, which constantly remained since the first seizure of the disorder, did never after deprive him of his senses: for he could walk or ride, even when it was at the worst. Fourthly, while the humour was moving up his hand, he could still use his fingers: but when it had got up to the arm, then were they deprived of feeling and motion: afterwards, upon its seizing the right side of the head, it occasioned violent convulsive motions of the arm for three or four minutes. Fifthly, at those times when the fit was wont to return, he was sometimes seized with the numbness twice or thrice in an hour; at other times not above once in two or three days. Sixthly, the disease was augmented by warm bathing: for,

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for, after it, the paroxysms were more violent than usual. Lastly, his memory was remarkably affected about the time of the paroxysm.

The same gentleman informed me likewise, that he knew several women who were subject to epileptic symptoms at the new and full moon; especially pregnant women, and those who stopped childing early, and whose menstrual purgations left them before the usual time. These were frequently seized by the fit in their sleep, and sometimes in the day-time also. And he remembered to have cured two young women, whose fits followed the change of the moon; but they were of that kind of epileptic fits, which are commonly called *St Vitus's dance*. Their gestures were very odd and uncertain, and somewhat like dancing: and they were deprived of speech, during the paroxysm. In fine, other physicians had tried in vain to cure these disorders by Sydenham's method *, for want of attending to their monthly periodical returns.

But no greater consent in such cases was perhaps ever observed, than what I saw many years since in a child about five years old; in which the convulsions were so strong and frequent, that life was almost despaired of, and by evacuations and other medicines very difficultly saved. The girl, who was of a lusty full habit of body, continued well for a few days; but was at full moon again seized with a most violent fit: after which, the disease kept its periods constant and regular with the tides. She lay always speechless during the whole time of flood, and recovered upon the ebb. The father, who lived by the Thames side, and did business upon the river, observed these returns

* In schelula monitoria.

to be so punctual, that not only coming home, he knew how the child was before he saw it, but in the night has risen to his employ; being warned by her cries, when coming out of the fit, of the turning of the water. This continued fourteen days, that is, to the next great change of the moon; and then a dry scab on the crown of the head (the effect of an epispastic plaster, with which I had covered the whole occiput in the beginning of the illness) broke; and from the sore, though there had been no sensible discharge this way for above a fortnight, ran a considerable quantity of limpid serum. Upon which, the fits returning no more, I took great care to promote this new evacuation by proper applications, with desired success, for some time; and when it ceased, besides three or four purges with *mercurius dulcis*, &c. directed to be taken about the new and full of the moon, I ordered an issue in the neck, which being thought troublesome, was made in the arm. The patient however grew up to woman's estate, without ever after feeling any attacks of those frightful symptoms.

Whether or no it be through want of due heed and inquiry, that we have not, in all the collections of histories and cases, any instance of the like nature so particular as this is, I will not take upon me to assert: but to me it seems probable, that when due attention shall be given to these causes, various examples will occur of the same kind of sympathy. In the mean time I cannot think it strange, that some of the ancients, as Aretæus has recorded*, attributed this disease entirely to the moon; and were of opinion, that the deity of that planet inflicted this

* De diuturnis morbis, lib. i. cap. 4.

kind of punishment on wicked people for their crimes, and therefore called it *the sacred disease*.

And it may not be improper to remark in this place, that the raving fits of mad people, which keep lunar periods, are generally accompanied with epileptic symptoms : which was attested to me as a constant observation by the late learned Dr Tyson, formerly physician to Bethlehem hospital, who upon that account usually called such patients epileptic mad.

The vertigo is nearly related to the epilepsy according to Galen * ; and therefore it was by the ancients called *the little epilepsy*, as Cælius Aurelianus relates †. This at least is certain, that both these diseases are frequently observed to obey the lunar influence : which is confirmed by several cases that fell under the observation of Dr Pitcairne.

Hysterical disorders do likewise partake of the same nature ; and therefore a just regard to those periods will contribute to happier success in the cure. One of Pitcairne's cases is that of a young married woman, of a fat habit of body, and red-haired, who never had her monthly evacuations in a proper quantity. She had for four years past complained of a troublesome weight or pressure on the crown of the head, and of a cold humour at the same time trickling down to her shoulders, with great giddiness and choking : she also threw up a sharp slimy humour from off her stomach, had a pain and squeezing about her heart, with a difficulty of breathing in the morning at uprising ; and these symptoms returned constantly every new and full moon.

* In aphor. Hippoc. comment. iii. aph. 17.

† De morb. chron. lib. i. cap. 2.

Carolus Piso, an accurate writer of medical observations, relates two cases to this purpose; the first of a lady of quality, whose left cheek and part of the neck were wont to swell very sensibly, about the new moon; and this symptom was constantly attended with an hysterical suffocation*. The second was of a girl, who, about each full moon of the spring-season, was seized with such obstinate hysterical symptoms, that they continued the whole third quarter. The first day she was convulsed, then she was seized with a loss of speech, and fell into a deep sleep, which lasted two days: and the remaining four days she spent in doing insignificant things, crying out for help, or in short in a slight delirium, without a wink of sleep †.

Physicians have recorded several remarkable instances of periodical palsies. The same Piso gives the following. An aged man was seized with a sleepiness and great lassitude, which was followed by a dead palsy, stupor, loss of memory, and some degree of folly, with a fever. These complaints returned regularly every new moon for two years; the symptoms gradually lessening, and the last fits had but a faint resemblance with those he suffered in the beginning ‡.

Tulpius, a very candid and judicious writer, relates a singular case of a shaking palsy, with which a maiden of a pale complexion, and phlegmatic habit of body, was afflicted during the space of three years, not constantly indeed, but with intermissions; each fit lasting near two hours, accompanied with a hoarseness and suppression of voice. The paroxysms mani-

* De morbis a serosa colluvie, obs. 27. † Obs. 28.

‡ Obs. 16.

festly agreed, sometimes with the tides, sometimes with the moon, and sometimes with the sun: for, according to the change of these, the returns were sometimes earlier, sometimes later *.

The ancients observed, and every one knows, how great a share the moon has in forwarding those evacuations of the weaker sex, which have their name from the constant regularity they keep in their returns. And there is no question to be made, but the correspondence which we here observe, would be greater still, and even universal, did not the infinite varieties in particular constitutions, climates, manner of life, and many accidents, one way or other concur to make a difference. It is very observable, that in countries nearest to the equator, where we have proved the lunar action to be strongest, these monthly secretions are in much greater quantity, than in those near the poles, where this force is weakest. This Hippocrates † takes notice of, with respect to places far north, and gives it as one reason, why the women in Scythia are not very fruitful.

The case being thus with females, it is no wonder, if we sometimes meet with periodical hæmorrhages answering to the times of the moon in males also. For as a greater quantity of blood, in proportion to the bulk in one sex, is the reason of its discharging itself through proper ducts, at certain intervals, when the pressure of the external air being diminished, the internal aura can exert its elasticity; so in the other, if at any time there happens to be a superabundancy of the same fluid, together with a weak tone of the

* Observ. med. lib. i. cap. 12. † De aëre, aquis, & locis.

fibres; it is plain that the vessels will be most easily burst, when the resistance of the atmosphere is least. And this more especially, if any accidental hurt, or rarefying force has first given occasion to the other causes to take effect.

I have known a young gentleman of a tender frame of body, but otherwise healthy, who having once, by over-reaching, strained the parts about the breast, fell thereupon into a spitting of blood; which for a year and a half constantly returned every new moon, and decreasing gradually, continued always four or five days: the fits being more or less considerable, according as his management about that time contributed to a greater or lesser fulness of the vessels.

Doctor Pitcairne's own case is remarkable, both in regard to the disease and its concomitant circumstances. In the year 1687, being at a country-seat near Edinburgh in February, on a fairer day than usual at that season, and the sun looking reddish; he was seized, at nine in the morning, the very hour of the new moon, with a sudden bleeding at the nose, after an uncommon faintness. And the next day, on his return to town, he found that the barometer was lower at that very hour, than either he, or his friend Dr Gregory, who kept the journal of the weather, had ever observed it: and that another friend of his, Mr Cockburn, professor of philosophy, had died suddenly at the same hour by an eruption of blood from the lungs; and also five or six others of his patients were seized with different hæmorrhages.

We have two notable instances of the like nature in our Philosophical Transactions; the one related by

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Dr Musgrave * of a person, who, from his infancy to the twenty-fourth year of his age, had every full moon an eruption of blood on the right side of the nail of his left thumb ; at first to three or four ounces, and after his sixteenth year, to half a pound each time ; which when, by searing the part with a hot iron, it stopped, he fell into a spitting of blood, and by frequent bleeding, &c. was very difficultly saved from a consumption. The other † is a story of an innkeeper in Ireland, who from the forty-third year of his life, to the fifty-fifth, (in which it killed him), suffered a periodical evacuation at the point of the fore-finger of his right hand ; and whenever they endeavoured to stanch the blood, it raised most exquisite tortures in his arm. And although the fits here kept not their returns so certain as in the fore-mentioned case, (it may be either from the irregular way of living of the patient, or the mighty change every effusion made in his habit of body, the quantity seldom amounting to less than four pounds at a time), yet there is this remarkable circumstance in the relation, that the first appearance of this hæmorrhage was at Easter, that is, the next full moon after the vernal equinox : which is one of the two seasons of the year, at which we have proved the attraction of the air, or diminution of its pressure, to be greater than at any other time whatsoever.

But we are besides this to consider, that the static chair, and nice observation taught Sanctorius ‡, that men do increase a pound or two in their weight every month, which overplus is discharged at the month's end, by a crisis of copious, or thick turbid urine.

* N^o 272. † N^o 171. ‡ Medic. static. § 1. aph. 65.

It is not therefore at all strange, that we should once a-month be liable to the returns of such distempers as depend upon a fulness of the vessels ; that these should take place at those times especially, when the ambient air is least able to repress the turgency ; and that though new and full moon are both of equal force, yet that sometimes one, and sometimes the other only should influence the periods, according as this or that happens to fall in with the inward repletion.

The fluor albus is a disease equally common and difficult of cure. Of this disease Dr Pitcairne has observed a case, which lasted four years ; wherein the returns came regularly at every new moon, and the discharge constantly lasted eight days.

Ulcers are liable to various accidents, which render some of them of uncertain prognostic : and yet even in these the afflux of humours is sometimes manifestly altered by this power. Baglivi * was acquainted with a learned young man at Rome, who laboured under a fistula in the abdomen, penetrating to the colon ; which discharged so plentifully in the increase, and so sparingly in the decrease of the moon, that he could make a very true judgment of the periods and quadratures of that planet, from the different quantity of the matter that came from him. This reminds me of the case of a young man, who after impure coition first felt a pain in his back, and a weakness and listlessness to walk in his thighs for four days. After this, appeared an ulcer in the glans penis, which ran with fetid matter. This flux stopped spontaneously in about a week ; but returned next new moon, and continued so to stop and return for

* De experiment. circa sanguin. operum pag. 449.

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some months ; till he was put into a proper course of medicine, whereby he was perfectly cured.

Nephritic paroxysms have frequently been observed to obey the lunar attraction. Tulpius * relates the case of Mr Henry Ainsworth, an English minister at Amsterdam, who had a fit of the gravel and suppression of urine every full moon ; of which he found no relief till the moon decreased, unless by bleeding at the arm. After his death two large stones were taken out of his bladder, and the pelvis of the left kidney was enlarged to that degree by the quantity of urine so often stopped there, as to contain almost as much as the bladder itself. He likewise saw a case of a capillorum mictus, which returned periodically every fortnight, with great difficulty of urine, and such uneasiness in the patient's body, that he could scarcely keep in bed †.

There is a fact almost contrary to these related by T. Bartholin ; who being called to a consultation on the case of M. Bullichius the chief magistrate of Copenhagen, found that for some years past he had been afflicted with a periodical diabetes spuria, which returned every month with pain after a severe nephritic fit, at or near the full moon ; when he made twelve quarts or twenty-four pounds of water, though he had not drank a pint ‡.

I was present, many years since, at the dissection of a child about five years old, who died of the frequent returns of nephritic fits, attended with vomitings and a diarrhoea. The kidneys and ureters were quite stuffed with a slimy calculous matter, and it

* Observ. lib. ii. c. 43. † Ibid. cap. 52. ‡ Acta med. & philos. Hafniens. vol. i. obs. 5.

was very instructive to see the different degrees of concretion in the several parts of it, from a clear limpid water to a milky liquor, which shot into bran-
chy crystals, and these coalescing became a hard fri-
able substance. Dr Groenvelt, who had attended
the boy in his illness, observed him to be seized with
his pains at every full moon for several months toge-
ther, which generally ended with the voiding of a
small stone or two.

To these nephritic cases I shall add one more,
which fell under my own notice. A young lady,
fourteen years of age, of a good complexion, was
from her infancy afflicted with this odd disorder. A
day or two before the full moon she waxed pale,
weak, dejected, and melancholy; and then unwittingly
discharged a large quantity of urine in her sleep.
And this discharge continued five or six nights toge-
ther: after which it ceased, and then her colour and
cheerful temper returned. The best strengthening
medicines were of no avail, until proper evacuations
were thought of, and made two or three days before
the return of the paroxysm; which prevented the
lunar influence.

That the fits of the asthma are frequently periodi-
cal, and under the influence of the moon, and also
of the weather, Van Helmont takes notice from his
own experience*. And Sir John Floyer, who has
given us a more particular history of this disease than
any other author, observes, that the fits usually re-
turn once in a fortnight, and frequently happen near
the change of the moon†.

* Asthma & tuss. § 22.
ma, p. 17.

† Treatise of the asth-

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A more uncommon effect of this attractive power is related by the learned Kirckringius. He knew a young gentlewoman, whose beauty depended upon the lunar force, infomuch that at full moon she was plump and very handsome; but in the decrease of the planet so wan and ill-favoured, that she was ashamed to go abroad; till the return of the new moon gradually gave fulness to her face, and attraction to her charms *. If this seems strange, it is indeed no more than an influence of the same kind with that which the moon has always been observed to have upon shell-fish, and some other living creatures. For as the old Latin poet Lucilius says :

*Luna alit ostrea, et implet echinos, muribu' fibras
Et pecui addit——†.*

And after him Manilius ;

*Si submersa fretis, concharum et carcere clausa,
Ad lunæ motum variant animalia corpus †.*

The knowledge of crises in acute diseases is attended with great difficulties : wherefore it may be very well worth the pains to inquire, what share such an alteration in the weight and pressure of the atmosphere may have in them. The ancients made great account of critical days, and regulated their practice in fevers according to the expectation they had from them. This part of physic is grown now into disuse, quite slighted, and even ridiculed; and that I suppose chiefly for these two reasons. For, in the first place,

* Observ. anatomic. 92.
lib. xx. c. 8.

† Apud A. Gellium,
Astronomic. lib. ii. ver. 93.

the earliest observations of this kind, which were drawn into rules, being made in hot eastern countries; when these came to be applied to the distempers of the colder northern regions, without allowance given for the difference of the climate, they were oftentimes found not to answer. And secondly, fevers of old were treated with few medicines, and chiefly managed by very slender diet: the motions of nature were carefully watched, and no violence offered to interrupt her work. The histories therefore of crises, though of great use and certainty under such management as this, were at length unavoidably set aside and lost; when acute cases came to be cured, according to this or that hypothesis, not only by evacuations, but hot or cold alteratives too: there being no longer any room for those laws of practice, which supposed a regular and uniform progress of the distemper.

Wherefore, in order to understand a little, both what might induce the first masters of our profession to so nice and strict an observance in this point; and what grounds there may be now for a more due regard to their precepts, even upon the score of the lunar attraction only; I propose a few remarks, after having premised some things proper to be known on this subject.

It is most certain, that epidemic fevers are caused by some noxious qualities of our atmosphere: and therefore it seems reasonable to suppose, that such changes as produce those effects may happen in it in all seasons by the influence of the moon. And this is confirmed by Ramazzini in his treatise of the epidemic constitution of the years 1692, 1693, and

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† Ibid.

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1694, in the city and neighbourhood of Modena. During these three years a very contagious purple fever reigned. "And it was worthy of observation," says he, "that the disease raged more violently after the full moon, and especially in the dark quarter; and abated upon the appearance of the new moon: as not only I, but other physicians here, constantly observed; and this observation was of great service both in the prognostic and cure*.

It is well known, that in solar eclipses the moon is in conjunction with the sun, and in opposition in lunar eclipses: wherefore there is nothing strange in what this same author wonders at in these words. "What happened January 21. 1693, was very surprising. For the moon having been eclipsed that night, the greatest part of the sick died about the very hour of the eclipse; and some were even struck with sudden death†." And the learned Ballonius relates a fact of the same nature, where he says, that some physicians having met on the case of a lady of quality; while they were actually in consultation, a solar eclipse was at hand. Wherefore, as they thought the patient in no imminent danger, they went out to view the eclipse: but they were soon called back, upon the lady's fainting away, the very instant it began. And she did not recover her senses till the eclipse was quite over‡.

If physicians had formerly been acquainted with what I have laid down on the moon's influence, I make no doubt but a much greater number of facts of this kind would occur in the histories of epidemic

* De constit. ann. 1692-3-4. Mutin. 1695. 4to, p. 97.

† Ibid. p. 98.

‡ Epidem. lib. i. p. 48.

diseases, than we find recorded at present, To those already mentioned let me add one more, which is the more interesting, upon account of the subject of it. It was our great genius and excellent philosopher the Lord High Chancellor Bacon, Viscount St Albans; who had this peculiarity in his constitution, that at every lunar eclipse he suddenly fell into a swoon; though he did not so much as think or even know of the eclipse; and did not recover till it was ended *.

And it is still fresh in the memories of some, that in that memorable eclipse of the sun which happened April 22. 1715, and in which the total obscuration lasted here at London three minutes and twenty-three seconds, many sick people found themselves considerably worse during the time: which circumstance people generally wondered at, but I could easily account for. In the morning I went with Dr Halley, and other astronomers, to the observatory on the top of the Royal Society's house in Crane-court, in order to view the eclipse, and consider the state of the weather, and changes that might probably happen in our atmosphere; and then the sun was very bright, and the sky remarkably serene. But when the eclipse became total, the air was so uncommonly cold and moist, that it made us shiver; and the face of nature appeared so extremely gloomy and dismal, that the birds fluttered about in wild affright, and the cattle in the fields stood fixed as statues, through excess of astonishment. Whereas, no sooner had the sun begun to emerge, but every creature assumed so cheerful an aspect,

* See Rawley's life of the Right Honourable Francis Bacon, Lord Verulam, &c.

that I never saw, nor indeed do I ever expect to see so pleasing a sight.

But to return to the subject of fevers: It is evident that those changes of the air which affect healthy bodies, must have a considerable effect on weak constitutions, and those labouring under acute diseases. To what has been already said on this head, I shall here add, that the plague itself is liable to be affected by the moon's action. For Diemerbroeck, who has given an accurate description of the plague at Nimeguen in the year 1636, observed, that the contagion constantly increased about the new and full of the moon; and that the greatest part of those who were then seized, died *. Much more may be said on this subject; but it appears too plain, to need further illustration: wherefore I return to the subject of crises.

First, all epidemic diseases do in their regular course require a stated time, in which they come to their height, decline, and leave the body free. This is so constant and certain, that when a fever of any constitution, which is continual in one subject, happens, from some other cause, in another to be intermitting; the paroxysms do always return so often, as all together to make up just as many days of illness, as he suffers, whose distemper goes on from beginning to end, without any abatement. Dr Sydenham, a sworn enemy to all theories, learned thus much from downright observation; and gives this reason why autumnal quartans hold six months: because by computation the fits of so long a time amount to 336 hours, or 14 days, the period of a continual fever

* De peste, p. 9.

of the same season *. So Galen takes notice, that an exquisite tertian is terminated in seven paroxysms; because a true continual has its crisis in seven days: that is, the fever lasts as long in one, as in the other; in as much (says he) as a fit in an intermitting fever answers to a day in a continual †. Now, this so comes to pass, because,

Secondly, in these cases there is always a fermentation in the blood, which goes not off, till the active particles are thrown out by those organs of secretion, which, according to the laws of motion, are most fitted to separate them.

Thirdly, as different liquors put upon a ferment, are depurated in different times; so the arterial fluid takes up a determined period, in which it is discharged of an induced effervescence.

Fourthly, the symptoms, during this ebullition, do not proceed all along in the same tenour; but, on some days particularly, they give such evident marks of their good or bad quality, that the nature of the ensuing solution may very well be guessed at, and foretold by them. Things being thus, those days on which the disease was so evidently terminated one way or other, were by the ancients called the days of crisis: and those upon which the tendency of the illness was discovered by most visible tokens, the indices of the critical days.

And thus far the foundation was good: but when a false theory happened unluckily to be joined to true observations, this did considerably puzzle the affair.

* Method. curandi febres, Lond. 1666, 8vo, p. 100.

† Comment. in aphor. Hipp. lib. iv. aph. 59. & de crisib. lib. ii. c. 6.

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Hippocrates, it is plain, knew not to what to ascribe that remarkable regularity, with which he saw that the periods of fevers were generally ended on the seventh, fourteenth, or one and twentieth day. The philosophy of Pythagoras was in those ages very famous, of which harmony and the mysteries of numbers made a considerable part; odd were accounted more powerful than even, and seven the most perfect of all. Our great physician espoused these notions, and confined the stages of acute distempers to a septenary progression *: upon which this inconvenience followed, that when a crisis fell out on an even day, his measures were quite broken, and he apprehended a relapse †; and if the fever did not terminate on the seventh, he waited for the fourteenth, and even for the twenty-first day.

But whereas the crises of fevers were sometimes observed to fall on the sixth or eighth day of the disease, without any return; Asclepiades rejected this whole doctrine as vain ‡: and Celsus, finding it to be too nice and scrupulous, observes, that the Pythagorean numbers led the ancients into the error §.

Galen, being aware of this, succeeded much better in his reasoning upon the matter; and very happily imputed the critical changes, not to the power of numbers, but to the influence of the moon; which, he observes, has a mighty action upon our earth, exceeding the other planets, not in energy, but in nearness †. So that, according to him, the septenary periods in acute diseases are owing to the quarterly

* De septimestri partu.

† Aphor. sect. iv. 36.

‡ Vid. Celsum. lib. iii. c. 4.

§ Ibid.

† De diebus decretor. lib. iii.

lunar phases, which are the times of the greatest force, and which return in about seven days *. Hence it appears, that Galen hit upon the cause of the changes in the returns and periods of fevers ; but did not so much as guess at the manner of its producing the effect.

The result of the whole affair in short is this. A crisis is no more than the expulsion of the morbid matter out of the body, through some or other of the secretory organs ; in order to which, it is necessary that this should be prepared and comminuted to such a degree, as is required to make it pass into the orifices of the respective glands. And therefore, as the most perfect crisis is by sweat, (both by reason that the subcutaneous glands do naturally discharge more than all the others put together ; and also that their ducts being the smallest of any, whatsoever comes this way is certainly very well divided and broken), so the most imperfect is a hæmorrhage : because this is an argument, that what offends is not fit to be cast off in any part, and consequently breaks the vessels by the effervescence of the blood. An abscess in those organs which separate thick slimy juices, is of a middle nature betwixt these two.

Now, it is very plain, that if the time in which either the peccant humour is prepared for secretion, or the fermentation of the blood is come to its height, falls in with those changes in the atmosphere which diminish its pressure at the new and full moon ; the crisis will then be more complete and large : and also, that this work may be forwarded or delayed a day upon the account of such an alteration in the air, the

* Ibid.

distension of the vessels upon which it depends, being hereby made more easy, and a weak habit of body in some cases standing in need of this outward assistance. Thus a fever, which requires about a week to its period, may sometimes have a good crisis on the sixth, and sometimes not till the eighth day, as Hippocrates has observed.

In order therefore to make true observations of this kind, the time of invasion is to be considered; the genuine course of the distemper must next be watched, which is not to be interrupted by any violent methods; the strength of nature in the patient is to be attended to, and by what secretions the crisis is most likely to be performed: and it will then be found, that not only the new and full moons, but even the southings, whether visible or latent, of the planet, are here of considerable moment.

To conclude, this powerful action of the moon is observed not only by philosophers and natural historians, but even by the common people, who have been fully persuaded of it time out of mind. Pliny relates, that Aristotle laid it down as an aphorism, That no animal dies but in the ebb of the tide *. And that births and deaths chiefly happen about the new and full moon, is an axiom even among women. The husbandmen likewise are regulated by the moon in planting and managing trees, and several other of their occupations. So great is the empire of the moon over the terraqueous globe.

* Hist. nat. lib. ii. cap. 98.

C H A P. III.

Of the benefits accruing to the practice of physic from this theory.

IT is now time to inquire, what use may be made of these observations in practice. And first, they must be of service in predicting the returns of the paroxysms, and the issue of the disease; which will gain reputation to the physician, and give confidence to the patient. But I will endeavour to shew, that they will be of greater service still, in contributing towards the cure of diseases. In order to which, I will first lay down some general remarks, and then descend to particulars.

It seems pretty evident, that all diseases whose returns answer to the changes of the moon, arise from repletion. For as the moon's action produces its effect by distending the vessels only, it is manifest, that plenitude alone can increase this distension, whether it happen by the quantity of the fluids, or their effervescence. And therefore all diseases, which return but once or twice in a month, and are increased by the moon's influence, require evacuations: which must diminish at least, if not cure the disease. But as regard is to be had to the nature of the distemper, and the time and manner of the evacuation; it is necessary to establish some rules on each of these heads.

First, then, we are to consider, whether the disease lies in the blood-vessels, or in the vitious quality of the fluids separated from the blood, and conveyed to some principal part of the body. In the first case we should

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should lay the greatest stress on phlebotomy ; in the second, on proper medicines for correcting the taint of the fluids. Besides, as we know by experience, that evacuations are to be made by the way which nature points out, great attention must be given to finding out that way in every particular disease. Then the best time for evacuating is in most cases a little before the paroxysm or exacerbation ; not only because its violence is thereby obviated, but likewise because the humours then turgid will flow out of the body with more ease, and in greater plenty. And in order to make this matter better understood, I will add some few practical remarks on the diseases mentioned in the foregoing chapter.

The epilepsy is extremely difficult to be cured in adults, but in children it is the reverse. And that evacuations, especially by a blister laid to the back part of the head, are of great use here, is plain from a case above related * ; which not only confirms the assertion of Panarolus, who says, that he cured a boy of seven years of age, who had been speechless, stupid, and epileptic, by a blister applied to the coronal suture † ; but proves the goodness of Celsus's advice, to apply cupping glasses with scarification to the occiput ; and besides to apply the actual cautery in two places, one in the occiput, and the other lower down in the neck upon the first vertebra ; in order to have a plentiful drain of the noxious humour ‡. For the head is the chief seat of diseases of this kind : frequently occasioned in children by plenitude, and the lentor of the blood, which has not been commi-

* Pag. 187.

† Obs. med. pentecost. iv. obs. 30.

‡ Lib. iii. cap. 23.

nuted by bodily exercise, or the action of the lungs; and in adults by a redundancy of humours, falls, or sudden frights. In this obstinate disease the most proper medicines for correcting the juices, seem to be native cinnabar, and more especially wild valerian root, before it has shot out its stalk; pulverized, and given frequently in a due quantity. For my part, I have several times found them both very successful; and for the virtues of the last, I particularly recommend the reader to Panarolus*, and the famous botanist Fabius Columna†. However, it must not be forgot, that this disease owes its origin to so many different causes, and is bred in so many different constitutions of body, that the same remedy, which succeeds in one case, often fails in another; and therefore different medicines are to be tried, especially on adults. And great regard must be had to the times in which the paroxysms most usually return, in order to effect a cure.

The vertigo is likewise cured by these same medicines. But the patient must be vomited now and then, and blistered on the head or neck. This is a disease of the eyes, and generally arises from too great tension of the extremities of the small arteries, as Bellini has demonstrated: wherefore it is no wonder if it should follow the changes of the moon.

Hysterical disorders are cured much in the same manner. But they seldom require bleeding, and purging should be used with caution. Emetics are of greater service, especially a little before the fit. For in the fit the best medicines are those which repair the loss of spirits, as gum ammoniac, Russian castor, salt of

* Obs. med. pen. 1. obs. 33.

† Phytobas. p. 120.
amber,

amber, in pills, and the like. And in most of those cases, care must be taken to adapt the medicines to the usual way of living of the patient, and to the affections of her mind.

The monthly returns of paralytic disorders, which are sometimes observed, are owing to the source of the disease, which is generally the head: in which the ferocities of the brain being extravasated, attack the origin of those nerves where they happen to lodge, and cause a palsy of this or that part. Hence it is, that this disease is very often the consequence of an apoplexy, under the shape of a general palsy, or that of one side only. But when this disorder is occasioned by an external injury done to the nerves, or by internal tumours, then it observes no regular periods. The cure is to be begun by evacuating the redundant phlegm, which in most cases is best done by stool; and then an eye must be had to the return of the distemper, not only by putting the patient into a course of attenuating medicines, as the horse-radish root, wild valerian root, mustard-seed, and such like; but also of cold bathing, if his age and strength will allow it: for this remedy is not so beneficial for old folks, as for young, but as it braces up the relaxed fibres, and promotes urine, it is proper for this disease in both these respects. For this reason the ancients according to Cælius Aurelianus *, ordered their paralytic patients to swim in the sea, or to undergo the cataractical course, by the fall of water from on high on the weak parts; on account of the greater weight of salt than fresh water, and the more intense cold of falling than still water.

* De morb. chronic. lib. ii. cap. i.

St. Vitus's dance is generally called a convulsive disorder; but I look on it to be rather paralytic, and to take its rise from a relaxation of the muscles, which being unable to perform their functions in moving the limbs, shake them irregularly by jerks. And it is for the most part but a slight evil, and commonly seizes weak habits of body: girls more frequently than boys, and seldom adults. Wherefore I never found it difficult to be cured by the cold bath and chalybeate medicines.

The disorders of the monthly evacuations of the fair sex require our serious consideration. As the excess of them generally proceeds from an acrimony in the blood, so the defect is chiefly owing to a lentor. For this flux is seldom suppressed for want of a sufficient quantity of blood: such wonderful art has the all-wise author of nature employed in making full provision for an evacuation, equally requisite for the health of the individual, and the propagation of human kind. Wherefore, as in immoderate discharges regard should be had to the times, when the effervescent humour can the more easily burst through its vessels, according to the doctrine already laid down; in order to make a revulsion at those times, by drawing blood from parts the most distant from the seat of the distemper: so when a suppression of the menses requires blood-letting, Vander Linden's caution is to be observed, which is recommended by Etmuller *, and rationally accounted for by Dr Freind †. Moreover, as the Peruvian bark is very powerful in allaying the effervescence of the blood,

* Tom. iii. p. 442. edit. 1736. p. 103.

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whereby the vessels are distended ; it will be very proper to give it plentifully some few days before the time that too great a discharge is apprehended.

The same method is to be observed in all periodical hæmorrhages, giving those medicines at the same time, which restringe and brace up the fibres : of which the best are burnt alum, with a fourth part of sanguis draconis, as I have found by repeated trials.

And it is worthy of remark, that so great is the moon's influence in cases of this nature, that upon the suppression of these evacuations from one part, the blood forces its way through some other part : which was the case of the young gentleman mentioned above *. For when his spitting of blood was stopped by the medicines just now recited, he was at the same stated times seized with a bleeding at the nose, which gave me no apprehensions, as the principal organ was no longer affected.

And this action of the moon extends even to those quadrupeds that are menstruated ; for it has been observed, that they generally have those evacuations about the new moon ; in particular mares and monkeys, and that so constantly, that, according to the testimony of Horus Apollo, the Egyptians painted the Cynocephalus to represent the moon, upon account of a certain sympathy, whereby the female of this animal has evacuations of blood from the uterus at the new and full moon : and they kept monkeys in their temples, in order to point out the times of the conjunction of the sun and moon †. Wherefore the moon's influence is apparent in all animals, provided irregularities in their way of living do not prevent it.

* Pag. 192. † Hieroglyphic. Vid. Gesner. de simiis.

And this theory accounts for the periodical returns of the fluor albus, which are sometimes observed, especially if the discharge be from the uterine vessels: for it issues sometimes from these, and sometimes from the glands of the vagina. In the first case, it stops upon the menstrual purgations; in the latter, it flows with them, and continues even in pregnant women.

Running ulcers are likewise comprehended in this doctrine, it being no way surprising, that the fore-mentioned causes should increase the discharge of pus, especially in those parts where the lax pliant texture of the body makes little or no resistance to the distension of the vessels. Hence in ulcers of the head it has been found, that the patients are in great danger at the new and full moon.

The best method of treating nephritic pains, is to begin by blood-letting. And it will be of service to the patient to observe, when the paroxysms are wont to return, and to empty the vessels, at the time which threatens the greatest danger. For it is well known, that this disease is partly occasioned by the compression of the small ducts of the kidneys from the fulness of the capillary arteries; which fulness is increased by the new and full moon. Whence I have more than once wondered, that the chief bent of the writers on this disease is, to drive down the gravel into the ureters and bladder: whereas the dissection of dead bodies has taught me, as I have mentioned before, that the first rudiments of a calculus are a very limpid serum in the caruncles of the kidneys; and that this may harden to the consistence of stone, will not seem strange to those who are acquainted with the attractive force of salts in solution, and with the effects

fects of obstructions in the capillary vessels. And hence it is, that calomel given now and then is of greater service in the beginning of this disease, than any diuretics: because this medicine removes the obstructions of the minute vessels, and thus prevents the cohesion of saline particles, which is frequently the consequence of such obstruction. Moreover, daily experience shews, that too free an use of diuretics is prejudicial in diseases of the kidneys. Which observation has not been sufficiently attended to by some physicians, who not only patronized a certain monstrous jumble of a medicine, till the legislature was wrought on to purchase the secret at an immense price; but still go on to drench their patients with it, and thereby injure the stomach, kidneys, and bladder.

Asthmatic disorders are likewise heightened by the lunar action, both on account of a lesser quantity of air taken into the lungs in each inspiration, and of the distension of the vessels by the rarefied blood: wherefore the returns of the fits are to be observed, and guarded against by moderate evacuations, as blood-letting, gentle vomits, laxatives, and sometimes cathartics. But every thing that heats the blood, should be carefully avoided, especially about the usual times of the paroxysms: because there is generally then a lurking fever; which ought not to be exasperated by heating food or medicines. Upon this score Hippocrates advises persons labouring under difficult breathing, to abstain from clamours and anger*. And Van Helmont observed, that asthmatic paroxysms return more frequently in summer than winter†. For which reason, the proper medicines in this disease, besides

* Epidem. lib. vi. sect. 4. † De asthm. & tussi.

those above mentioned, are such as are cooling, and at the same time promote urine; as vinegar of squills; spirit of nitre; gas sulphuris, which is water saturated with the fumes of sulphur; and several others of the same nature, enumerated by Sir John Floyer.

To what has been said above on crises in acute diseases, it may be worth while to add this one remark. Although great care should be taken, not to raise any commotion in the humours on the coming on of a crisis; yet there are cases, in which there is a necessity of making some evacuations: as for example, if the fever runs very high, the humours are so agitated, that no secretions can be performed. In this circumstance phlebotomy is so far from obstructing, that it promotes the crisis: in the same manner, as in the small-pox and measles, before any appearance of the pustules, when the turgescence of the humours is excessive, taking away some blood facilitates and hastens the eruption.

The case is much the same with critical abscesses, wherein the fulness and feverish heat are sometimes so great, that they require moderate evacuations, either by bleeding or purging. For it is to be observed, that the reason why the ancients condemned purging in fevers, was, that the most of their cathartics were very violent; as scammony, black hellebore, juice of spurge, and others of the like acrid nature: upon which account they contented themselves with emptying the intestines by clysters. But as we have always a good stock of gentle cathartics, we may safely give them at any time of the disease, without the least apprehension of heating the body; especially if nature points out this way, as she frequently does.

C O R O L.

C O R O L L A R Y.

Wherein the preceding reasoning is confirmed by observations of the effects of storms on the human body.

AS we have endeavoured to prove, in the beginning of this treatise, that the celestial motions, which occasion certain distempers, and their periods or returns at stated times, are likewise able to raise winds; and that we feel the different effects of these, according as other causes concur to put the air into violent agitations: it may not be amiss to give some few instances, how much this reasoning is confirmed by facts.

On the twenty-sixth of November, 1703, there arose a most furious storm of wind a little before midnight, which lasted upwards of six hours. The history and whole theory of this wonderful phenomenon I shall not attempt to compile. This province was by the Royal Society conferred on the learned Dr Halley, who was every way equal to the task. Wherefore I shall only touch on some circumstances of it, which more immediately relate to the present theme.

The moon was then in her perigæum, and near the change: and it has been proved above, that both these circumstances contribute towards attracting the air upwards, and raising winds*. Accordingly, the barometer was lower than usual†, and the subsequent tides were very high. And most probably there was a concurrence of one or more of the other causes already assigned‡, though it might be difficult to

* Pag. 171. 172. † Phil. Trans. N^o 289. ‡ Pag. 179.

come at the knowledge of them: but as the state of the weather in the preceding seasons of the year is of easier, and perhaps not less useful, consideration; I shall remark, that in those places particularly, which felt the rage of the storm, the summer and part of autumn were remarkably wet; and the winter was ushered in by open warm weather; so that a thermometer (whose freezing point was about eighty-four) was very seldom below a hundred to the latter end of November*. Hence we may form a probable conjecture, that the atmosphere was blended with vast quantities of saline and sulphureous exhalations; which, by their various combinations and agitations, at length gave that destructive force to the motion of the air. And this conjecture is confirmed by the flashes or coruscations, which were observed during the storm; and by the saline particles found the next day on the leaves of vegetables, even at many miles distance from the sea; where the grass in some places tasted so salt, that the cattle did not care to eat it.

Instead of prosecuting this subject farther, I think it may not be amiss to subjoin this remark; that as the new or full moon is capable of causing those alterations in the human body, which we have already mentioned, even when it is not seconded by any other cause; so if it be accompanied with a tempestuous state of the weather, the effects will be the more sensibly felt. And indeed I myself remember, that several persons complained particularly of head-achs the very night of the storm. But the case of a lady of quality of my acquaintance is very remarkable, who was struck blind in an instant that same night. Her

* Phil. Trans. N^o 289.

blindness

blindness was the *ἀμαλυσίς* of the Greeks, or the *gutta serena* of the modern physicians : and as this is a distemper which does not seem to me to be sufficiently understood, I will offer my thoughts on it in few words.

The cause of it is generally an obstruction and subsequent distension of the capillary arteries of the retina, or some injury done to the optic nerves. In the first kind, which is vastly the more common, the sight is darkened gradually ; in the last, the sight is lost, sometimes sooner, sometimes later, according to the cause, and sometimes in fine in an instant. For the optic nerves are injured many ways, and rendered incapable of performing their office : as by a blow, fall, fracture, or depressure of the scull they are often compressed ; in convulsions they are sometimes loaded with extravasated humours ; and not uncommonly they are seized with a sudden palsy. And in the dissection of persons who had been long afflicted with epilepsies, I have observed, that the optic nerves were pressed on by an extravasated lymph collected just over the place, where after their junction they separate, to run to the eyes : and in paralytic disorders I have found the fibres in that place wasted and dry.

I could produce a number of observations from medical writers in confirmation of this theory : but I believe the following few may suffice. Felix Platerus, a physician of great experience, observed, in the dissection of a dead body, a tumour, resembling a gland, lying on the optic nerves, and obstructing the passage of the animal spirits to the eye *. Guernerus Rolfincius found both the optic nerves wasted,

* Observat. lib. 1.

in the body of a woman which he opened *. Johannes Scultetus † saw the optic nerves wasted to half their usual size, in the body of a woman who had had a gutta serena for twenty years. And the Ephemerides naturæ curiosorum contain the unfortunate case of a young girl, who, from a blow on the left part of the head, was seized with a fever and delirium, then lost her sight, and died soon after. Upon opening the head, a great quantity of limpid serum was found in the ventricles of the brain, especially forwards, where it entirely compressed the optic nerves ‡.

Now, as to the case of the lady struck blind during the storm, I think it no difficult task to account for that misfortune upon the foregoing principles, by saying, that the moon's action, vastly increased by the concurrence of the storm, was capable of obstructing the passage of the animal spirits to the optic nerves in a tender constitution, as effectually as if these nerves had been cut through; and consequently of giving rise to the gutta serena.

Concerning the use of this theory, I can safely say, that it has pointed out to me the true method of treating this distemper, which before my time was generally esteemed incurable: and as the true knowledge of the causes of diseases is a sure foundation for practice, so I have succeeded in a number of trials on cases of this kind. Wherefore when the capillary arteries are the seat of the disease, the proper medicines are those which most effectually attenuate the viscid humours, and remove the obstruction: and such are

* Dissert. anat. lib. iv. cap. 31. † Armament. chirurg. obs. 36. ‡ Vid. miscell. curios. anni 1686.

the chemical preparations of mercury. And these are to be continued a good while, and frequently even to raising a salivation, which is to be kept up twenty or thirty days.

But when the disease proceeds from a defect in the nerves, it requires a different method of cure from the preceding one; and is to be varied according to the injury which the nerves have received. But it plainly appears from what has been said, that this species of the gutta serena is generally incurable. For who, but the almighty Maker, can pretend to restore to the optic nerves their natural tenour, either when obstructed, or their cavities straitened by a viscid sluggish humour, or when wasted and shrivelled up; or to make a free passage for, and give a due impulse to the animal spirits, when those nerves are become paralytic? But if any hopes remain, while the disease is yet recent, a caustic is to be applied to the crown of the head, over the meeting of the coronal and sagittal sutures; and then the periosteum is to be laid open, to make an outlet for the noxious humour from the brain. And this ulcer, like common issues, must be kept open with peas, and continued a long time: in the mean while the patient is to be put into a course of nervous cephalics, as wild valerian root, Russian castor, gum ammoniac, asa foetida, volatile spirits and salts of the animal tribe, &c.

But to return to storms: There happened a most violent one in England, on the third day of September 1658, the day of the death of Oliver Cromwell. As we have no journals of the weather for that year, that ever came to my knowledge, I can say nothing of the preceding state of the air. But this

this is remarkable, that the storm happened near the autumnal equinox, and about the full moon : which concurrence of causes is very well adapted to stir up great commotions in the atmosphere. However that be, it is to be observed, that the disease of that great man was of that kind which we have shewn to be particularly under the moon's influence. For it is upon record, that he died of a fever accompanied with grief, from the unhappy state of his domestic affairs : and it is very certain, that grief disposes the animal spirits to be easily affected by causes of this nature.

But to come to a conclusion of this little work : It has been observed of those countries which are subject to inundations, that these calamities generally happen at the times when the moon's action is most powerful : so that the learned Baccius * seems to have reason for his conjecture, that the chief cause of these evils is to be sought for in excessive high tides, with the unhappy concurrence of the attractive faculty of this or that planet.

Such are the natural causes of storms and hurricanes : but as to the question of the divine power, Whether or no the wrath of the Almighty sends these calamities on mankind, contrary to the ordinary course of nature ? I will not take upon me to determine, who have no intention to disengage mens minds from the bands of religion. For though I am thoroughly convinced, that each part of the universe is constituted and moved by certain laws ; and that the same disposition of the fabric, which is the most convenient for the whole, sometimes brings inconveniencies and even

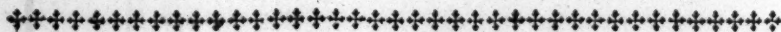
* Del tevere, lib. iii. p. 228.

destruction in some particular places : yet it is highly equitable, that the omnipotent Creator should be allowed to have an absolute dominion over all his works. And possibly it was agreeable to the divine wisdom, to create the world in such a manner, that natural causes should now and then produce evils and inconveniencies on mankind ; whom it was necessary to affright with storms, thunder, and other extraordinary phænomena, in order to keep them in a continual sense of their duty.

O R A-

ORATIO ANNIVERSARIA
HARVEIANA :

In theatro Regii Medicorum Londinensium
Collegii habita, ad diem xviii Octobris,
MDCCXXIII.



PRÆSIDI ILLUSTRISSIMO
SOCIISQUE DOCTISSIMIS
REGII MEDICORUM LONDINENSIIUM COLLEGII
DE ARTE MEDICA INDIES OPTIME MERENTIBUS
ORATIONEM HANC
IN PRÆSTANTISSIMORUM HOMINUM LAUDEM
QUI MAXIMIS SUIS BENEFICIIS
ARTEM ILLAM SUSTENTARUNT
AMPLIFICARUNT ET EXORNARUNT
HABITAM

L. M. Q. D. D. D.

RICHARDUS MEAD.

O R A-

ORATIO ANNIVERSARIA HARVEIANA.

ILLUSTRISIME PRAESES,
COLLEGAE SPECTATISSIMI,
AUDITORES HUMANISSIMI,

SI, quantam vim habent ad humanas mentes amore laudis ac gloriae incitandas magnarum virtutum exempla, tantum ego ingenii et eloquentiae in laudandis illis heroibus, quorum hodie nobis commemoranda sunt beneficia, afferre possem; haudquaquam tane verer, ne aut illorum meritis parum conveniens, aut vestris auribus minus grata, quam nunc habiturus sum, foret oratio. At vero, cum haec res longe aliter se habeat, et neque natura aptus, neque usu instructus ad dicendum, jussu vestro hoc muneris susceperim; ne importuna artis affectatione vobis sim taedio, historici potius, quam oratoris partes agens, honores medicinae recensebo; et per quos maxime reges aut principes, et quos apud populos, creverit salutaris hujus professionis gloria, in brevi quasi tabella vobis proponam. Et dum hoc faciam, partem laudis istius haud infimam nostrae genti merito attribui debere manifeste ostendam; quo nihil aut mihi ad recitandum jucundius, aut vobis, opinor, ad audiendum acceptius, aut omnibus nobis ad praedicandum honestius esse potest.

Ab Aegyptiis autem, antiquissimis illis omnis fere sapientiae magistris, incipiam; apud quos tanto fuit in honore ars nostra, ut ne reges quidem ipsi illam facere infra dignitatem suam existimaverint. Osirin et Isin in primis reginam medendi peritia excelluisse

accepimus. Post horum tempora medicis ex publica pecunia dabantur praemia; et Sacri titulum ferebat liber, in quo descriptae fuerunt leges, ad quas morbis acutis laborantes curare licebat *.

Graeci uti artes omnes subtilius, quam Aegyptii excoluerunt; ita praesertim medicinam, quae ex cognitis paucarum herbarum viribus, et populari experientia constabat, in scientiam redegerunt. Fama celebres apud eos antiquitus fuerunt scholae non paucae, Rhodia cum primis, Crotoniensis, Cnidia, Coa, et Smyrnaca. Crotoniensem illustravit Democedes, cui Darius rex Persarum, inter captivos apud ipsum agent, acceptum restitutae sanitatis beneficium magnis divitiis et honoribus rependit; non sine insigni humanitatis, qua nihil magis medicum commendat, in Democede exemplo. Cum enim rex medicos Aegyptios, qui se in principio morbi imperite tractassent, occidi iusserat; ille culpaе hujus veniam impetravit, et gratiae loco habuit concessam illis cum vita libertatem †.

Ceterarum autem omnium gloriam Coae obscuravit scholae felicitas, postquam ex illa prodierat, qui primus hanc disciplinam a studio sapientiae separavit, divinus Hippocrates. Magno nomini adsurgimus omnes! et parentem medicinae veneramur! qui non tantum sapientissimis praeceptis artem hanc formavit, sed et ipse vita et moribus perfectissimi medici exemplar expressit. Tanto itaque viro maximos honores delatos minime miramur, neque hos tantum a Cois suis, qui imagine ipsius nummos signarunt ‡, sed etiam ab universa Graecia; quae communi concilio, quod “venientem ab Illyriis pestilentiam praedixerat,

* Diod. Sicul. l. i. p. m. 74. † Herodot. lib. iii. c. 129. &c. ‡ Vid. Numm. in Titul.

“discipulosque

“discipulosque ad auxiliandum circa urbes dimiserat, honores illi, quos Herculi, decrevit *.” Civem porro adscripserunt Athenienses, auro coronarunt, et victum illi et posteris in Prytaneo dederunt †, qui honos in Graecia maximus habebatur. Athenienses enim, cultissimi scientiarum aestimatores, hanc artem plurimi semper fecerunt; apud quos antiqua lege cautum fuit, “Ne quis servus, neve qua femina medicinam disceret ‡.” Et tam ab iis, quam ab aliis Graeciae civitatibus, honores et immunitates eximiae publicitus medicis concedebantur §.

Hinc maximi omni aevo apud Graecos viri medicinam callere laudi sibi duxerunt. Pythagoras et Democritus primi omnium de virtutibus herbarum scripsere †. Aristoteles, hereditario quasi jure ad se pertinere hanc artem ratus (ab Æsculapio enim genus duxit →), medicinam non didicit tantum, sed et facultavit ++; librosque de plantis, de anatomicis, et *injuris* etiam edidit =. Quin et medendi peritia Magni Alexandri benevolentiam sibi primum conciliavit; quem cum gravi morbo oppressum liberasset, hanc ab eo facultatem rex invictissimus doceri voluit; neque illam interdum exercere vile, aut a summa sua dignitate alienum, judicavit **. Crevit postea hæc laus in familia Aristotelis, cujus ex filia nepos, nomine Erasistratus, magnam consecutus est famam. Is sectam longe celeberrimam condidit; quam in schola Smyrnaea, jam antea memorata, ad suam fere aetatem, quo tempore illi praesidebat Hicesius, Strabo floruisse

* Plin. N. H. l. vii. c. 37. † Soran. in vit. Hippocrat. ‡ Petit. leg. Attic. l. iii. tit. 8. § Lucian. abdicat. p. m. 457. † Plin. l. xxv. c. 2. → Diog. Laert. in vit. → Ælian. var. hist. l. v. c. 9. = Diog. Laert. ibid. ** Plutarch. in vit. Alex.

tradit *. Tam insignis porro fuit, qui in hac urbe medicis habebatur honos, ut mihi sane gratuler, qui, hanc occasionem nactus, notitiam illius ex antiquitatis tenebris jam primus in lucem proferam. Honos autem, quem dico, is erat, quo communiter cum praetoribus, summis nimirum urbis magistratibus, ornabantur, ut nomen eorum nummis imprimeretur. Praeterea quo magis ostenderent Smyrnaei, in quanto pretio esset apud eos ars nostra, medicorum nomina deorum salutarium imaginibus in nummis adjungi volebant; quorum multi ex altera parte caput Hygiae, ex altera vero Jovis Aesculapii effigiem cum perspicuis medendi artis insignibus exhibent. Neque Erasistrateos suos tantum ita honestabant; sed nonnullis etiam zemulae Herophileorum scholae, quae iisdem aetatibus in loco procul dissito, "fanum Mensis Cari" appellato, inter Laodiceam ad Lycum et Carura, magna cum laude florebat †, eundem honorem tribuebant.

A Graecis ad Romanorum tempora devenientibus minus angusta primo intuitu, et parum laeta sese offert rerum nostrarum facies. Servos fuisse, qui primi Romae medicinam fecerunt, vulgo creditur; et pulsos urbe exulasse medicos, Catone censore, scriptis prodiderunt nonnulli. Haec, in opprobrium artis prolata, quodnam habeant fundamentum, operae est disquirere. De servitute mox dicam: primum autem de exilio quaestionem, calumniam rectius dixeram, paucis expediam. Nulla certe veterum annalium fide, nullis antiquorum monumentorum indiciis nititur hoc commentum. Primus, quod sciam, in vulgus edidit vanissimus ille "De vanitate scientiarum" scriptor ‡,

* Georg. lib. xii. sub finem.

Strabo dict. loc.

† De van. scient. cap. 83.

Cornelius Agrippa. Ansam vero ad hoc fingendum dedit Plinius *, qui "populum Romanum ultra sexcentiesimum annum sine medicis degisse, et expertam tandem damnassem medicinam," adductis etiam Catonis ad Marcum filium adversus hanc artem dictis, memoriae mandavit. Tantum autem valuisse aut atrocem animum, aut auctoritatem Catonis, ut medicos urbe pelleret, nusquam legimus. Neque damnavit omnem medicinam populus; sed in ea, quae manu curat, secandi urendique saevitiam (quam tamen ipsa non raro imperat misericordia) ut novam, et aspectu terribilem improbavit.

Sed missum faciamus hoc convicium, quod non semel antea diluerunt viri eruditi; et qualis fuerit medicorum Romae degentium conditio, praesertim num servilis, paululum dispiciamus. Romani artes omnes a Graecis acceperunt, et sero quidem, "rudi scilicet et bellicosa civitate non magnopere liberalibus disciplinis vacante †." Nec grammaticam quidem, aut poeticam, ante annum quingentesimum excoluerunt ‡. Primus autem, anno supra quintingentesimum tricesimo quinto, medicus e Peloponneso Romam venit Archagathus; cui is honor habitus est, ut "jus Quiritium ei datum sit, et taberna in compito Acilio emptæ ob id publice §." Magna seculo sequenti fama fuit Asclepiadis Bithyni, tam dicendi quam medendi arte insignis, quo se medico amicoque usum fuisse L. Crassus apud Ciceronem testatur †; ex cuius etiam posteris, ut videtur, "Calpurnius Asclepiades, a divo

† Nat. hist. l. xxix. c. i.

† Sueton. lib. de illust.

grammat. in princ.

† Cic. in Brut. c. xviii. & Tuscul. Quæst. in princip. ubi vid. not. Davissii.

§ Plin.

N. H. l. xxix. c. i.

† De orat. l. i. c. 14.

“ Trajano parentibus, sibi, et fratribus septem civitates impetravit *.” Neque diu post, cum jam quotidie quaestus causa ex Graecia Romam adirent medici, Julius Caesar, in cujus manus tunc temporis summa rerum potestas devenerat, omnes hanc artem profectos civitate donavit †. “ In servos autem id beneficium fuisse collatum, vel suspicari,” ut cum viro inter literatos principe loquar, “ nimia est stultitia ‡.” Nihil igitur servile, aut tenue quidem, artem nostram adhuc dedecorat. Sed ut plane, et sine fuco, totam rem dicam ; simul cum ingenuis multis et doctis viris non pauci scientia et fortunae bonis inferiores illis temporibus Romam veniebant ; qui, etsi non medicamentis, sed manu curarent, medici tamen appellabantur. Hi in divitum et magnatum clientelam se conferebant, et servi agebant, donec civitatem consequerentur ; inde liberti, nomen familiae alicujus Romanae sibi adsciscere solebant ; neque raro, si ingenium studio literarum excoluissent, morbis etiam internis medebantur, et in medicorum clinicorum censum veniebant. Tali conditione fuit Antonius Musa, cui, postquam ejus opera ex ancipiti morbo convaluerat Octavius Augustus, statuat, aere collato, populus Romanus posuit ||. Augustus quoque ei jus annuli aurei, et immunitatem non ipsi tantum, sed omnibus medicinam profitentibus, in posterum tempus concessit †.

Non igitur ars erat servilis apud Romanos medicina ; sed liberalis, et tanto in honore, ut etiam pars ejus chirurgica, quae a servis, et exili forte homini-

* Inscript. antiq. apud Spon. recherch. curieus. disert. 27. † Sueton. in vit. c. 42. ‡ Casaub. in dict. vit. Suet. c. 4.

|| Sueton. in vit. Aug. c. 59. † Dio H. R. l. liii. sub fin.

bus exerceri poterat, libertatem saepe daret, et magnas opes. Haud exigua sane iis temporibus erant medendi facultatis praemia. Principum medicis annua statuebatur merces. Iis autem, referente Plinio, "imputavit Stertinius, quod quingentis sestertium "millibus," pecuniae nostrae plusquam ter mille et sexcentis libris, "contentus esset; cum sexcenta "quaestu urbis sibi esse, numeratis domibus, ostenderet *." Ipse vero et frater ejus sua pecunia Neapolin operibus exornarunt, et tamen "census trecen- "ties centena millia sestertium heredi reliquere †." Omitto plura exempla memorare, neque vobis Cassios, Calpetanos, Arruntios, Albutios, Rubrios sistam, Romana nomina, quae professione medicinae et opibus claruerunt. Praeterire autem nequeo, in nummis Rubriorum conspici anguem, deae Salutis signum, monumentum, ut videtur, familiae sibi medicinae laudem vindicantis. Miror itaque in nummis istis explicandis neque Patinum, neque Vaillant, viros de re nummaria optime meritos, hanc, arti suae adeo honorificam, inter alias ejus rei causas longius petitas attulisse ‡. In summa, ita non semper tenui fortuna homines Romae erant medici, ut etiam imperatorum saepe amici essent et familiares ||.

Neque putet quisquam gratia tantum singulari in hunc aut illum collocata fuisse, qualia diximus beneficia; arti habebatur honos, et universis eam profitentibus dabantur immunitates. Collegium enim, five scholam, ut vocabatur, medicorum in urbe fuisse, ex antiquis marmorum inscriptionibus apparet †.

* Lib. xxix. c. 1. † Ibid. ‡ Vid. Patin. & Vaill. fam. Rom. || Vid. Spon. recherch. curieus. dissert. 27; † Mercur. art. gymn. l. i. c. 7.

Quales autem legibus dabantur illis immunitates, veterum jurisconsultorum libri nos docent. Exempla e multis pauca tantum proferam. Constantini Magni imperatoris exstat hoc rescriptum: "Medicos, et maxime archiatros, grammaticos, et doctores legum, una cum uxoribus et filiis, nec non et rebus, quas in civitatibus suis possident, ab omni functione, et ab omnibus muneribus, vel civilibus vel publicis, immunes esse praecipimus; et neque in provinciis hospites recipere, nec ullo fungi munere, nec ad judicium deduci, vel exhiberi, vel injuriam pati; ut si quis eos vexaverit, poena arbitrio judicis ple-ctatur*." Nec novo prorsus favore his omnibus beneficiis tum primum facultas haec salutaris honestabatur. Jam ante enim "medicis et philosophis, ne hospitem reciperent, a principibus fuisse immunitatem indultam," imperatores Vespasianus et Hadrianus rescripserant†. Item Antoninus Pius a muneribus civilibus et publicis "immunes esse medicos" jusserat‡. Deinde post hos omnes Julianus, qui, nisi nomini maculam fixisset hostile erga Christianos odium, inter sapientissimos imperatores jure censeretur, non sine honorifico utilitatis artis nostrae testimonio, superiorum principum decreta de medicis, lege lata, sancivit, eosque a curialibus muneribus liberos esse voluit||. Sed de rebus medicis apud populum terrarum orbis dominum satis, opinor, dictum fuit.

Si medicinae autem tempora, et varias quasi aetates spectemus, ad Arabes jam, simul cum armis literarum studia agitantes, nos deducit orationis filum.

* Leg. 6. cod. de profess. et med. † Leg. ult. § ult. ff. mun. & hon. ‡ Leg. 6. § 2. ff. de excusat.

|| Vid. Julian, epistol.

lis enim seculis, quibus foeda barbaries ceteras fere nationes obduxerat, penes eos permansit artis hujus scientia. Deficiunt quidem hac in parte annales medici, et linguae suae difficultatibus involuta in bibliothecarum forulis latent, quae de medicorum historia gentis illius scriptores memoriae mandarunt, aliquando forsan in lucem protrahenda. Speciminis autem loco ex ineditis illorum monumentis observare libet, imperatoris medico annuo stipendio fuisse “quindecies centena millia drachmarum*”; quæ, si ad nostram pecuniam exigantur, plusquam tricies mille librarum summam conficiunt. Ingentem sane, et forsan vix credibilem esse hanc principum munificentiam, quis dicet. At non tam ministri, quam consilarii, imo affines regum, apud eos habebantur medici; et terrarum reditus, et urbium praefecturae illis saepe in mercedem cedebant.

Postquam, renascentibus literis, antiqui doctrinae fontes recludi, et in Italia primum, inde et in ceteris Europae regionibus, fervere studia scientiarum coeperunt, apud alios et alios populos medicina honores varios sortita est; utque gloria aluntur artes, ita haec semper accepta beneficia magnis in rempublicam utilitatibus rependit. Longum esset scholae Salernitanae, Bononiensis, Patavinae, Montis Pessulani, Parisiensis, et aliarum quam plurium jura et immunitates

* Osaibea de vitis medicorum, ms. Arab. Drachmae autem hic non Atticae, sed Arabicae intelligi debent; quarum hae, si Golio credamus in Lex. Arab. tertia parte illis sunt leviores. Nec longe discrepat Gravii sententia, qui, ex comparatione cum granis nostris discrimen petens, veterem Atticorum drachmam grana 67. Arabicam vero $47\frac{4}{5}$ exaequare statuit. Vid. Greaves's discourse of the Roman denary, p. 61. 115.

explicare;

explicare ; verum illud memorare juvat : ut nusquam honoratior, quam apud nos, existit medicina ; ita nullum collegium, absit verbis invidia, virorum ingenio et doctrina excellentium hoc nostro fuit feracius.

Amplissimus hic dicendi campus sese aperit ; sed monet me praescriptum munus, ne exiguum hoc temporis spatium, de medicis optime meritorum memoriae sacrum, medicorum praeconiis effluere sinam ; dicant potius exteri, quantum per Anglorum labores in medicinae studio ipsi profecerint. At quidni dicam rara felicitate id nobis contigisse, ut, qui hic salutaris scientiae lumina claruerunt, iidem dignitatis nostrae auctores et custodes beneficentissimi celebrentur ? Ecquis Linacro, qui sub auspiciis regis invictissimi, Henrici Octavi, primus nos auctoritate instruxit, sapientiores, et literis cultiores dicet quempiam ? Ecquis Caio, qui insignia potestatis ad decus et ornamentum addidit, artē praestantiores ? An Harveio, qui potentiam opibus auxit, sagaci ingenio, et naturae scientia, ullum inveniemus parem ? Hi nimirum veterum sapientium more, relicta patria, terras alio sole calentes adierunt, Italiam in primis, antiquum illud Musarum sacrarium ; ubi parum illis fuit omne disciplinarum genus toto pectore haurire, et domum adferre ; adhuc majora animo conceperunt, formam nempe reipublicae medicae, qua in unum corpus, quasi membra, coirent artis professores. Amant enim societatem scientiae ; et concordia, tanquam communi anima, vigent. Hinc alius post alium, veluti vicario studio, legibus et statutis sodalitium hoc communiverunt ; rerum gestarum annales condiderunt ; et solenne convivium, cum grata bene meritorum de nobis commemoratione, instituerunt.

erunt. Vivite aeternum, illustria nomina ! Vestrae, dum stabit bonos medicinae, manebunt laudes ; stabit autem, quamdiu cura sui tanget mortales, et morbis opportuna reddet corpora in luxum et libidinem proclivis hominum natura. Sed et alios, quos habuimus ejusdem laudis aemulos, silentio premere est nefas ; Caldwellum, Gullstonum, Cronium, qui amplissimis honorariis chirurgiae et incisionis studium promoverunt ; ut etiam munificentissimum Hamaeum, cui viventi aedes nostras, morienti praediorum suorum hereditatem debemus. Ut magnae autem sunt apud bonos virtutis illecebrae, illius praecipue, qua publicae utilitati consulitur ; spectata haec medicorum liberalitas, et in commune studia sua conferentium generosus ardor, alios quoque viros, sanguine pariter ac literis illustres, in laudis ejusdem partem attraxit. Nec sequior sexus ἀσύμβολος esse voluit, ut, quibus ob teneram formam plus est in arte nostra praesidii, aliquid etiam ad ejus decus afferre viderentur. Honoratissimae igitur feminæ, regia etiam stirpe illustres, Arabella Stuarta, et Maria Comitissa Salopiensis, socia beneficentia, ad levandos sumptus in aedibus nostris emendis factos, pecuniam larga manu donaverunt. His adjungam nobilissimum virorum par, Joannem Lumleium Baronem, et Henricum Durnovariae Marchionem ; quorum ille cum Caldwello, quem dixi, junxit munificentiam : hic in tanto nos habuit amore, ut non modo bibliothecam dederit, optimis libris instructissimam ; sed et inter nos censer, comitiis nostris interesse, et rem medicam sedulo procurare voluerit. Omne fane felici ! cum et nunc nobis gratulemur optimatem, honoris insignibus illustrissimum, et hos tamen animi magnitudine vincentem, tabulis

bullis nostris suo nomine decus et splendorem addidisse. — Non ultra pergam magnorum virorum laudes, quas nec hominis disertissimi vox aequare posset, ingenii culpa imminuere. Humanitatis profecto et scientiae exempla, quae vos, collegae ornatissimi, assidue ostenditis, memoriam illorum quavis oratione longe melius consecrabunt. Etenim dum illorum vestigia premitis, quotidianum illis instauratis laudis monumentum, et prudentis consilii, ac bene collocatae operae testimonium perhibetis perpetuum. Quis praesidem illustrissimum, strenue ac prudenter auctoritatem nostram tuentem, suspicit; et Linacri sapientiam haud statim sibi repraesentat? Quis censoribus imperitorum artis perniciosam audaciam, coercentibus, et ne qua in pharmacis nostris conficiendis fraus fiat providentibus, gratiam habet; vel quaestoris in aerario administrando fidem et frugalitatem laudat; vel omnes vos denique sine malis artibus salutis civium prospicientes, et pro meritis divitiis et honoribus auctos veneratur: nec eorum, qui primi hujus disciplinae fundamenta posuerunt, atque hoc domicilium scientiae condiderunt, benefacta simul honorate praedicat, summisque laudibus in coelum extollit? Maesti igitur este sapientia, viri clarissimi, coeptam viam pergite. Hac enim ratione laudis aequae ac vitae lampada filiis tradetis; atque hi iterum nepotibus; qui, majorum exempla sequentes, collegii hujus jura, decus, et dignitatem, in omne aevum duratura (ita voveo et auguror) suis etiam posteris farta tecta conservabunt. Dixi.

VIRO

VIRO DOCTISSIMO

JOHANNI FREIND,

RICHARDUS MEAD,

S. D.

Fidem tandem libero, amicissime vir, et rationem, quam in variolis curandis teneo, una cum exemplis aliquot quae hanc illustrent simul et confirmant, quae a me petisti ut chartis mandarem, ea nunc ad te mitto.

Sermo noster erat, uti memini, de morbo, ubi ad summum incrementum pervenit, et quo modo eo tempore continendus sit aeger; dixi me jam ab aliquot annis usu comperisse, commodissimum esse, plerisque saltem in casibus, alvum ducere; nunc, quo consilio, et qua cum cautione id primum fecerim, describam breviter.

Medicos nostros ita plerumque sollicitos habet pustularum consideratio, ut ab omni fere vacuatione periculum esse putent, nimirum ne ab hac materiae corruptae concoctio turbetur, aut in partes propulsio prohibeatur.

In faciei et manuum intumescencia spem omnem ponit Sydenhamus; cum tamen mori videamus quotidie, quibus cutis etiam ad summum intumuit, et, ipso fatente, plurimis in casibus nulla arte promoveri possit salutaris ille tumor.

Mortonus, dum in committendis cum veneno mor-

sine ulla insigni manuum intumescencia, febricitet aegrotus, et imminutis admodum viribus torpeat magis, quam calore uratur.

In hujusmodi aegritudine, imponenda sunt brachiis et cruribus emplastra vesicatoria; neque tamen ab omni purgatione abstinendum est, sed ea esse debet lenissima et viribus aegrotantis accommodata, et per intervalla repetita; eo enim magis necessaria est, ubi non intumescunt partes, ventris solutio, quoniam in plerisque his casibus, etiam ipsa, quae in pustulis est, faecies magnam partem in pus non convertitur.

Illud in universum hic tenendum est, majorem jam habendam esse virium aegri, quam pustularum rationem: peracta jam est omnis quae per cutem fieri potest morbidae materiae propulsio; per alias igitur vias ducendus est, qui periculum minatur noxius humor. Cessant ab officio nunc salivae canales, quique a primis fere morbi diebus magna copia per hos fluxit, viscidus jam haeret, et vix exspuitur liquor. Urinae excretio, si forte fuit per aliquot dies larga et benigna, saepius tamen illa hoc tempore cum difficultate et solito parcius redditur. Restant igitur expurgandae intestinorum glandulae, quae eo sunt corruptis humoribus e sanguine derivandis accommodatiores, quo natura crassiorem lentorem expellunt.

Id vero monuisse debueram, non hoc tantum tempore, sed et nullo non morbi die, aegro protinus mittendum esse sanguinem, si respirandi difficultas urgeat, si supervenerit phrenitis, aut alia quaevis nimii fervoris febrilis se prodant indicia.

Ex innumeris exemplis quae mihi quotidiana experientia suppeditat, pauca tantum seligam, ut quomo-

do haec medicina ad varios et difficillimos casus accommodetur, ostendam.

Adolescenti annorum fere sedecim, nono aegritudinis die intumuerunt admodum caput et manus, accessit vero febris, cum magno praecordiorum aestu, spiritu difficili, et delirio. Misso quamprimum e vena brachii ad ζ xvj. sanguine, dedi pil. ruff. 3 fs. et elapsis horis decem, cum nondum responderet alvus, elect. lenitiv. 3 vj. largiter purgatus haustum sumpsit anodynum; hinc adeo se remisit febris, et levata sunt symptomata, ut, praeter spem, brevi convaluerit, licet in misellum adeo saevierit morbus, ut, vitata a pustulis in utroque oculo tunica cornea, visu privatus vitae dulcedinem amiserit.

In uno atque altero adolescente eodem fere modo laborante feliciter expertus sum, minime ab hac medicina abstinendum esse, etiam si (quod non raro fit) crebra in pustularum intervallis exanthemata erumpant, et malignitatis nomine adstantes terreant; haec enim non febrem solvunt, sed materiae morbidae copiam et lentorem indicant; quo magis necessarium est, interposito tempore, alvum saepius ducere.

In puella quinque annos nata, apparebant inter pustulas a primis decubitus diebus hic illic maculae purpureae et lividae; manus vero nono die intumuerunt; die decimo, assumpto electuario lenitivo mota est alvus; postero die, frons, quam alba quasi vesica obdlexerat, livore decolorata est: hanc spiritu vini tepido foveri jussi; singulis noctibus medicamento narcotico conciliatus est somnus; decimo quarto die, nunc primum imminuto manuum tumore, iterum purgata est; ut et die decimo sexto; jamque quae faciem exasperaverat

asperaverat crusta nigra dehiscere coepit, et tarde licet dirupta certam tamen spem salutis ostendere.

Accidit interdum, sed raro, ut sub finem aegritudinis repullulet quasi morbus, et succedentibus sub crustis, quibus obducta est cutis, novis pustulis, remascatur; unde pro humoris abundantia etiam ultravicesimum diem porrigitur malum; illud nuper vidi in nobili femina annorum quadraginta, quae opimo corporis habitu, etiam tertium succrescentibus variolis materiam suffecit; facta hinc est per omnia membra continuata exulceratio, ad diem usque vicesimum et octavum se excipientibus crustulis, ita ut ex longo decubitu ulcera in lumbis gangraenae metum attulerint. Die duodecimo, leni potione purgata est; decimo quinto, subsidente qui ad hunc diem duraverat, manuum tumore, iterum alvum subducere necesse habui; et, interjectis tribus vel quatuor diebus, purgationem repetiit ad usque morbi exitum; restituto tandem in integrum, post longam valetudinem, ulcerato corpore.

Omni de purgatione dubitationem tollit nonnumquam in gravissimis casibus ipsa natura, dum in inferiora noxiam materiam depellit, continuato per plures dies alvi fluxu; hoc cum fit, ita nunc comprimi nunc solvi debet venter, ut ne nimiae dejectiones vires prosternant. Incolumis hoc modo evasit nuper admodum nobilissimus adolescens, annorum 18. Huic facies sexto die, sine ullo tumore, chartae pergamenae speciem referebat; suppurationis signa nulla erant; quapropter imposita sunt membris emplastra vesicatoria, quae solito plus humoris educere observavi. Die nono, manibus nihil prorsus intumescantibus, supervenit diarrhoea; hanc sumptum saepius cum confectioe

fracastorii rhabarbarum ita compescuit, ut ter tamen quaterve quotidie minimum deiceret aeger; decimo, quarto die, rupta in facie membrana tenui sanie erosa subtus apparebat cutis, non ante vicesimum diem deciditibus penitus squamulis; alvus vero, per omne id tempus, eo quo dixi modo, fluebat.

Et sane, ut finem tandem faciam, vix quemquam graviter hoc morbo correptum salvum fieri vidi, nisi cui, declinante febre, aut largiter profluens urina, aut resolutus venter, saluti fuit. Ut de infantibus nihil dicam, quos per totum morbum cita alvus periculo plerumque liberat.

Haec habui, vir eruditissime, quae tecum super hac re communicarem; tu illis sic utaris velim, ut dum nostras has rationes acri tuo judicio perpendis, quantum momentum eae habere possint etiam in aliis interdum febribus, quae difficulter et tarde solvuntur, dispicias. Mihi certe ita feliciter cessit haec medendi via, ut humani generis interesse putem, ut illa publici juris fiat. Sed de hoc tu statues, ut voles; ego satis superque habeo tibi morem gessisse, et quanti tua mandata faciam hoc officio comprobasse. Vale, et me tui amantissimum, quod facis, ama.

Dabam Calend. Septemb. 1716.

An

An ABSTRACT of part of a letter from Dr
Bonomo to Signior Redi, containing some
OBSERVATIONS concerning the WORMS of
HUMAN BODIES.

HAVING frequently observed that the poor women when their children are troubled with the itch, do with the point of a pin pull out of the scabby skin little bladders of water, and crack them like fleas upon their nails; and that the scabby slaves in the bagnio at Leghorn do often practise this mutual kindness upon one another; it came into my mind to examine what these bladders might really be.

I quickly found an itchy person, and asking him where he felt the greatest and most acute itching, he pointed to a great many little pustules not yet scabbed over, of which picking out one with a very fine needle, and squeezing from it a thin water, I took out a very small white globule scarcely discernible: observing this with a microscope, I found it to be a very minute living creature, in shape resembling a tortoise, of whitish colour, a little dark upon the back, with some thin and long hairs, of nimble motion, with six feet, a sharp head, with two little horns at the end of the snout.

Not satisfied with the first discovery, I repeated the search in several itchy persons, of different age, complexion, and sex, and at differing seasons of the year, and in all found the same animals; and that in most of the watery pustules, for now and then in some few I could not see any.

And though, by reason of their minuteness, and colour

colour the same with the skin, it is hard to discern these creatures upon the surface of the body, nevertheless I have sometimes seen them upon the joints of the fingers in the little furrows of the cuticula, where with their sharp head they first begin to enter, and by this gnawing and working in with their body, they cause a most troublesome itching, till they are got quite under the cuticula; and then it is easy to see how they make ways from place to place by their biting and eating, one single one happening sometimes to make several pustules, of which I have often found two or three together, and for the most part very near to one another.

With great earnestness I examined whether or no these animalcules laid eggs, and after many inquiries, at last by good fortune, while I was drawing the figure of one of them by a microscope, from the hinder part I saw drop a very small and scarcely visible white egg, almost transparent, and oblong, like to the seed of a pine-apple.

I oftentimes found these eggs afterwards, from which no doubt these creatures are generated, as all others are, that is, from a male and female, though I have not yet been able, by any difference of figure, to distinguish the sex of these animals.

From this discovery it may be no difficult matter to give a more rational account of the itch, than authors have hitherto delivered us. It being very probable that this contagious disease owes its origin neither to the melancholy humour of Galen, nor the corrosive acid of Sylvius, nor the particular ferment of Van Helmont, nor the irritating salts in the serum or lymph of the moderns; but is no other than the
continual

continual biting of these animalcules in the skin, by means of which some portion of the serum oozing out through the small apertures of the cutis, little watery bladders are made, within which the insects continuing to gnaw, the infected are forced to scratch, and by scratching increase the mischief, and thus renew the troublesome work; breaking not only the little pustules, but the skin too, and some little blood-vessels, and so making scabs, crusty sores, and such like filthy symptoms.

From hence we come to understand how the itch proves to be a distemper so very catching; since these creatures by simple contact can easily pass from one body to another, their motion being wonderfully swift, and they as well crawling upon the surface of the body as under the cuticula, being very apt to stick to every thing that touches them, and a very few of them being once lodged, they multiply apace by the eggs which they lay.

Neither is it any wonder if this infection be propagated by the means of sheets, towels, handkerchiefs, gloves, &c. used by itchy persons; it being easy enough for some of these creepers to be lodged in such things as those; and indeed I have observed that they will live out of the body two or three days.

Nor in the last place shall we be at a loss to know the reason of the cure of this malady by lixivial washes, baths, and ointments made up with salts, sulphurs, vitriols, mercury's simple, precipitate, or sublimate, and such sort of corrosive and penetrating medicines. These being infallibly powerful to kill the vermin lodged in the cavities of the skin; which scratching will never do, partly by reason of their hardness, and

and partly because they are so minute as scarcely to be found by the nails.

Neither do inward medicines perform any real service in this case, it being always necessary after a tedious use of these to have recourse to those external ones already mentioned. And if in practice we oftentimes experience, that this disease, when we think it is quite cured by unction, does nevertheless in a short time return again, this is not strange, since though the ointment may have killed all the living creatures, yet it may not probably have destroyed all their eggs, laid as it were in the nests of the skin, from which they may afterwards breed again and renew the distemper. And upon this account, it is very advisable after the cure is once performed, still to continue the anointing for a day or two more; which it is the easier to do, because these liniments may be made agreeable enough, and of a good smell, as particularly is that compounded of the ointment of orange flowers or roses, and a small quantity of red precipitate.

AN ACCOUNT of three cases of the HYDROPHOBIA.

THE symptoms from the bite of a mad dog are so surprising and terrible, that it is hardly possible to describe the agony of a patient in this unhappy condition. I have lately had the opportunity to see two instances of this case.

The first was of a lad of about the age of nine years, a sturdy and bold boy. A mad bitch of the mongrel kind was hunted in the street, he struck at her with a stick, and she flying in his face, bit him in the right

right cheek, which was torn with a large wound to the middle of the nose. This was on the 20th of April last, 1709. A surgeon cured the wound in about fourteen days time, by applying for the first three days, theriac. andromach. in. sp. vin. and afterwards dressing it with liniment. arcei and balsam. terebinthin. No other care was taken; only a bolus of theriac. andromach. was given him every night while under cure, and quickly after he was bit, he was persuaded to eat the whole liver of the bitch fried.

He continued very brisk and well to the 22d of May; upon that day he seemed dull and sick, would eat no dinner, except a little boiled spinnage, walked out in the afternoon, and in the evening complained of his stomach and head; his mother gave him a small glass of brandy, for he would drink nothing else. In the night he was very bad, started often, and screamed out as in an agony, especially when desired to drink, and complained miserably whenever he made urine, saying it hurt him. The next morning he vomited up the herbs he had ate the day before, unaltered. I was sent for that day in the afternoon, and found him in a perfect agony, all in a sweat, trembling, tossing himself up and down, talking continually, looking very wild; his pulse low, and sometimes quicker, then slower: his urine made the night before as well coloured as ordinary. I desired him to drink; he took a little in his mouth, but as it was going down, he threw it out with violence, saying it hurt him; and praying that he might take no more. We over persuaded him to hold a little in his mouth, and swallow it by degrees and gently; he did so with a little more ease, but was glad when it was over.

We

We bid him suck the drink through a quill ; he tried, but could not get it down by continual gulps, but stopped as soon as a very little was passed, still crying out that it hurt him to swallow it.

I presently declared the case to be desperate. However, for the satisfaction of the relations, blistering plasters were applied to the back and on each side of the neck ; and a diuretic bolus of sal. succin. camphor. and conserv. lujul. was given every six hours ; for he seemed from the first of his complaint to have a difficulty of urine.

The next day, the 24th at noon, I found him much worse ; he had raved all night ; could not bear the sight of any thing white, and said, that if all the women in the room who had white aprons would go out, he should be well presently. He said he would drink if we would give him it in a black cup ; but when brought, made many excuses, and could not, though at the same time he complained he was dry, and pleased himself with talking of full pots. He ate some bread and butter heartily, but vomited it up quickly together with a frothy slime. We dipped him in a tub of warm water ; he said he was not afraid of water, and was quiet in it for a little while, but soon fell into a convulsion-fit, which obliged us to take him out. I observed his eyes to grow more staring, and the pupil to be prodigiously enlarged. He was thrown continually with such violence from place to place, that it was very hard to keep him in bed ; and quite tired and spent, fell into cold sweats, and died this day at four in the afternoon.

The next day I obtained leave to open the body. We examined the brain, throat, breast, and stomach ;

but

but met with no extraordinary appearance any where, excepting that there was a great quantity of greenish viscid bile in the stomach.

The other patient was a very lusty vigorous man of 45 years. He had ten weeks before been bit in one of the fore-fingers near the nail, by a little naked dog of the Guinea breed. On the 8th of November in the morning he complained of a great sickness at stomach, and vomited green and yellow choler. The next morning he took a dose of rad. ipecacuanh. Whilst he was vomiting, he complained of a difficulty of swallowing; and when pressed to drink to work off the medicine, contrived himself a way of sucking the gruel given him, through a piece of a tobacco-pipe, but could not get down above one pint; and though he afterwards often tried this trick, yet it did not succeed.

On the 10th he had eight ounces of blood taken away at the arm, and took a bolus of theriac. andromach. with lap. contrayerv.

I came to him on the 11th; found him tied in his bed, raving mad, biting and spitting at the bystanders, crying out murder, making an odd noise as if he coughed up something from the throat; this motion I had also took notice of in the boy, and I suppose this is what some authors have called barking.

He said he would drink if we would unbind him, and give him water; but as soon as it came to his mouth, he threw away the cup with the greatest fury imaginable, and grew so unruly, that he was with much ado tied down again.

I observed that he had a palsy of his right arm, for he moved this only by the help of the other; and

those who attended him, had taken notice that this symptom began the day before, and that at the same time he had endeavoured to read, but could not, complaining of a mist before his eyes.

As he seemed afraid of every body, so he shewed the greatest enmity to those, for whom at other times he used to have the most love and respect.

I ordered a surgeon to take away 20 ounces of blood at his arm; and observed it to be very thick and black. He was very tame after this for a few minutes, but fell again into his outrageous fit, in which he soon laid himself down quite spent, and died.

I could not by all possible means get leave to open the body.

Since these accidents I have had an account sent me by a surgeon from Stamford in Lincolnshire, of a young man of about 18 years, who died hydrophobous by the bite of a mad fox, that had been bit by a mad dog. The symptoms discovered themselves three months after the wound, which was upon the back of the hand, and being healed by the application of theriaca andromach. had left a small black scab behind.

Three days before his death he was seized with a fever, for which he was bled, vomited, and blistered; he bit to pieces the glass in which drink was given him. When dissected, the fauces were found very much inflamed; the left lobe of the lungs black, with the vesicles full of black blood; the surface in some places, which the blackness had not covered, appearing blistered, as if raised by cantharides. The liver was hard and of a yellow bilious colour.

During

During the whole violence of the distemper, the penis was observed to be continually erected, and as hard as a bone. This symptom is particularly taken notice of by Cælius Aurelianus.

The surgeon who opened the body, with his knife slightly wounded his fore-finger, and was surprised to find that it festered, and gave him much more pain than a greater cut had at other times done. This I the rather took notice of, because something of the same nature happened to the surgeon who dissected my patient. His hand the following night was taken with an erysipelas, attended with great tension and pain: this was owing to a little wound made in one of his fingers a day or two before, from which, in turning over the parts, he had rubbed off the plaster; and it went not off without the continued application of cooling and discutient medicines.

From all these histories, it may not perhaps be wrong to conclude, that the * hydrophobia (a name not very proper for the distemper) is the effect of a particular kind of an inflammation in the blood, accompanied with so great a tension and driness of the nervous membranes, and such an elasticity and force of the fluid with which they are filled, that the most common representations are made to the mind with too great effect, and the usual impressions of objects upon the organs cannot be suffered: hence proceed the timorousness, unaccountable anxiety and inquietude, which are always the forerunners of the dread of liquids; as also did the pain in making water, and the strange aversion observed in the boy at the sight of any thing white; the retina being really hurt and

* Vid. essays on poisons.

grieved by the striking of the rays of light upon it. Nor is it hard to conceive that when the salival liquor is hot, and the throat inflamed and dry, the swallowing of drink should cause such an intolerable agony; no more than it is that, when things are wrought up to this wretched condition, the dismal tragedy should not last above three or four days at most, in which the patient is perfectly fatigued and torn to death by the violence of his actions and efforts.

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An ANNIVERSARY ORATION in honour of HARVEY,
&c.

Delivered before the Royal College of
Physicians at London, upon the 18th
of October 1723.

TO THE MOST ILLUSTRIOUS PRESES,
AND THE VERY LEARNED FELLOWS
OF THE ROYAL COLLEGE OF PHYSICIANS AT LON-
DON,
THOSE UNWEARIED PROMOTERS OF THE MEDICAL
ART,
THE FOLLOWING ORATION,
COMPOSED IN HONOUR OF THOSE WORTHIES,
WHO, BY THEIR MOST EXTENSIVE LIBERALITY,
HAVE SUPPORTED, IMPROVED, AND EMBELLISHED
THE SAME,

16

MOST RESPECTFULLY INSCRIBED

BY

RICHARD MEAD.

An ANNIVERSARY ORATION
in honour of HARVEY, &c.

MOST ILLUSTRIOUS PRESES,
MOST RESPECTFUL COLLEAGUES, and
COURTEOUS HEARERS,

Examples of remarkable virtues have the greatest tendency to fire the minds of men with the love of praise and glory ; if then, in praising those worthies whose favours are this day to be commemorated by us, my genius and eloquence be any how proportionable to the subject, I would not be afraid that the harangue I am now to deliver, should disparage their merits, or prove nauseous to your ears. But as this is far from being the case, and as I have undertaken this task by your orders, I shall, though neither cut out by nature, nor trained by practice to speak in public, in recounting the praises of medicine, act rather the part of an historian than an orator, and lay before you, as in a short map, what kings and princes, and what states have advanced this salutary profession ; in doing of which, I shall clearly prove, that no small part of these panegyrics is to be ascribed to our own nation, than which nothing can be more agreeable for me to evince, or for you to hear, nor more honourable for all of us to declare.

To begin therefore with the Egyptians, who were indeed a people the most ancient, and real masters of wisdom ; among them was our art in so great esteem, that even their monarchs did not think it below them

to practise it. We are informed, that Osiris and Queen Isis in particular were very great adepts in physic. Since their times rewards were assigned to physicians out of the public treasury, and the book which contained the rules for curing those affected with acute diseases, was held sacred *.

As the Greeks studied all the arts with more accuracy than the Egyptians, so more especially that of medicine. This at first consisted of the knowledge of a few simples and their powers, together with popular experience; but they reduced it to a science. Among the Grecians were many famous medical schools, particularly those of Rhodes, Croton, Cnidus, Coos, and Smyrna. The school at Croton was rendered famous by Democedes, whom Darius King of Persia, when, among others, he was his prisoner, highly rewarded and honoured for restoring him to health. At this time Democedes exhibited a remarkable instance of humanity, than which nothing more recommends a physician. The case stands thus: When Darius had ordered the Egyptian physicians, who had treated him harshly in the beginning of his malady, to be put to death; Democedes, by his intercession, procured them not only their life, but their liberty †.

The success however of the school at Coos obscured the glory of all the rest, in regard the divine Hippocrates was educated there, who first made this art a distinct study from that of philosophy. We all rise to the mighty name! we adore the parent of physic! who not only has formed this art by the wisest maxims, but has himself, in his life and practice, copied the most

* Diod. Sicul. l. i. p. m. 74. † Herodot. lib. iii. c. 129. &c.

consummate physician ! No wonder then that the highest honours were conferred upon him, not only by the people of Coos, who impressed his image upon their coins* ; but by all Greece, which, for his having forewarned them of a pestilence coming from Illyrium, and sending his scholars to aid the cities all about, in a public assembly voted him the same honours they did to Hercules †. Moreover, the Athenians made him free of their city, crowned him with gold, and allotted him and his posterity a subsistence in their Prytaneum ‡, which is the highest honour they could bestow. The Athenians were a very polite people, and very fond of the sciences, and always had the medical art in the highest estimation, insomuch that they enacted, by an express ancient law, that no slave nor woman should ever learn physic §. And both by them, and all the other states of Greece, extraordinary honours and privileges were publicly granted to physicians ¶.

Hence it is, that the greatest men in all ages among the Greeks reckoned it their glory to understand physic. Pythagoras and Democritus were the first who wrote of the virtues of herbs +. Aristotle looking upon this art as hereditary, (for he derived his pedigree from Æsculapius ++), not only studied physic, but frequently practised it = ; and published some books concerning plants, anatomical subjects, and those skilled in the several branches of phy-

* Vid. Numm. in Titul. † Plin. N. H. l. vii. c. 37.
 ‡ Soran. in vit. Hippocrat. § Petit. leg. Attic. l. iii. tit. 8.
 † Lucian. abdicat. p. m. 457. + Plin. l. xxv. c. 2.
 ++ Diog. Laert. in vit. = Ælian. var. hist. l. v. c. 9.

fic *. Nay, by his skill in physick, he insinuated himself into the favour of Alexander the Great, who, having by his means recovered of a dangerous illness, wanted to learn the art, and was far from thinking it contemptible or below his royal dignity to practise it †. Afterwards Aristotle's family became more remarkable in this respect, and Erasistratus his grandson by a daughter acquired great reputation. He founded a very famous sect, which, as Strabo informs us, flourished in the school of Smyrna above mentioned, almost to his days; at which time Hicesius had the direction of it ‡. So remarkable was the respect paid to physicians in this city, that I cannot help congratulating myself in having this opportunity of rescuing it from the darkness of antiquity. Now, the honour I speak of was the same with that of the chief magistrates of the city; namely, having their names inscribed upon the coins. In fine, the people of Smyrna, in order to show in what esteem this art was among them, chose to have the names of physicians inscribed upon their coins, together with the images of their tutelar gods; and upon one side of those coins is to be seen the head of Hygia, on the other, the effigy of Jupiter Æsculapius, with evident appendages of the medical art. Nor did they thus dignify their own physicians only, but paid the same respect to some of Herophilus's school, though a rival, which at the same time flourished with great applause ||, in a very distant place, named *the temple of Mensis Carus*, betwixt Laodicea, towards Lycus and Carura.

When we leave the Greeks, and come down to the

* Diog. Laert. ib. † Plutarch. in vit. Alex.

‡ Georg. lib. xii. sub fin. || Strabo dict. loc.

times of the Romans, the aspect of our affairs is, at first sight, far from being so venerable or amiable, in regard it is commonly believed that slaves first practised medicine at Rome; and some authors inform us, that during Cato's censorship physicians were expelled the city. It is worth our while to inquire, what foundation these opprobrious reflections may have. Of the slavery by and by. Permit me, in the first place, briefly to discuss that question, or rather calumny, with respect to the banishment of the physicians from Rome. Surely this fiction is supported by no ancient annals of credit, nor by any thing that can be learned from old monuments. The first who broached this falsehood, so far as I know, was that bungling writer, concerning the vanity of the sciences, Cornelius Agrippa *. I own he was in some measure led into this mistake by Pliny †, who has told us, that the Roman people lived above 600 years without any physicians, and condemned their art, after having tried it. The invectives too of Cato to his son Marcus, against the medical art, no doubt contributed to this error of his. We do not however any where read, that the surly spirit or authority of Cato was of such weight, as to procure the banishment of the physicians from the city. Nor did the populace condemn the whole art, but that part of it which is performed by manual operation; amputations and searings, they looked upon as uncommon pieces of cruelty, terrible even to a spectator, which yet pity to the patient renders often necessary.

But to drop this reproach, which has been often confuted by men of letters; let us a little inquire,

* De van. scient. cap. 83. † Nat. hist. l. xxix. c. 1.

what

what was the state of physicians living at Rome, and whether they were slaves or not. The Romans received all their arts from the Grecians, and that late too, as this unpolished and warlike state was not much employed in the liberal sciences *. Nor did they cultivate grammar or poetry, till five hundred years after the building of their city †. In the year of the city 535, Archagathus the first physician came from Peloponnesus to Rome, and was honoured with the right of Roman citizens; and, in consequence of this, had a shop purchased for him at the public charge, in the Acilian street ‡. Great in the age following was the fame of Asclepiades the Bithynian, a remarkable orator and physician, whom L. Crassus, in Cicero, mentions ||, as his physician and friend; and Calpurnius Asclepiades, probably one of his posterity, obtained of the Emperor Trajan for his parents, himself, and brothers, seven cities †. Soon after also, as physicians from Greece daily resorted to Rome, for the sake of gain; Julius Cæsar, upon whom at that time the supreme power was devolved, made free of the city all the professors of this art †. Now, to use the words of an eminent learned man, so much as to suspect that ever this favour was conferred upon slaves, is extremely foolish ††. Nothing then servile or mean hitherto disgraces our art. But, to speak plainly and without reserve, it is not to be denied, that, with many learned gentlemen, not a few inferiour to

* Sueton. lib. de illust. grammat. in princ. † Cic. in Brut. c. xviii. et Tuscul. quest. in princip. ubi vid. not. Davissii. ‡ Plin. N. H. l. xxix c. 1. || De

orat l. i. c. 14. † Inscript. antiq. apud Spon. Recherch. curieuses. dissert. 27. † Sueton. in vit. c. 42. †† Casaub. in dict. vit. Suet. c. 4.

them,

them, both in point of knowledge and fortune, came at this time to Rome; who, though they did not prescribe medicines, but performed manual operations, went notwithstanding by the name of physicians. These became the vassals of rich and great men, and were slaves till they obtained the freedom of the city, when they assumed the name of some Roman family; and, upon their improving in learning, they cured internal diseases, and were associated with those physicians who attend patients confined to their beds. This was the situation of Antonius Musa, for whom the Romans erected a statue, contributing money for that purpose, because he had cured Octavius Augustus of a dangerous illness *. Augustus too advanced him to the senatorian dignity, and granted a dispensation from all troublesome offices, not only to him, but to all the professors of physic for ever †.

Physic then was not a servile, but a liberal art, among the Romans, and was held in so great honour, that even the chirurgical part of it, which could be practised by slaves, and persons of the meanest rank, procured them their liberty, and vast riches. In those times the rewards given to the faculty of physicians were very considerable. To the physicians of princes an yearly salary was allotted. And, as Pliny informs us, Stertinius charged it upon them as a fault, that he was satisfied with 500,000 sesterces, which is more than 3600 l. of our money; whereas he could prove, by numbering the houses, that they gained above 600,000 in the city ‡. Yet this Stertinius and his brother beautified Naples with fine buildings, and left to their heir a revenue of three hundred times an

* Sueton. in vit. Aug. c. 59. † Dio. H. R. l. liii. sub fin. ‡ Lib. xxix. c. 1.

hundred thousand sesterces *. I forbear to multiply examples, and shall only mention these Romans, the Cassii, the Calpetani, the Arruntii, the Albutii, and Rubrii, all eminent professors of medicine, and rich at the same time. I cannot however but take notice, that upon the coins of the Rubrii is to be seen a snake, the symbol of the goddess of health, which, it seems, is a monument of some family laying claim to the honours of medicine. It is strange that neither Patinus nor Vaillant, men eminent in explaining coins, have mentioned this so honourable to their art, among other causes of the same thing, which are farther fetched †. Upon the whole, so far were the physicians at Rome from being always men of low fortunes, that they were often related to, and intimate with the emperours themselves ‡.

Nor let any body imagine, that the benefits we have been speaking of were by a singular favour confined to individuals; no, the art was generally respected, and privileges were granted to all that professed it. That there was a college or school of physicians (as it was called) in the city, is plain from the ancient marble inscriptions §. And the books of ancient lawyers inform us, what sort of privileges the laws allowed them. I shall only produce a few of many examples. This grant of the Emperour Constantine the Great is upon record.

“ We order physicians, especially such as attend prin-
 “ ces, grammarians, and doctors of laws, together with
 “ their wives and sons, to live unmolested in the pos-
 “ session of their effects in their respective cities, to be

* Ibid. † Vid. Patin. et Vaill. fam. Rom. ‡ Vid. Spon. Recherch. curieuses. dissert. 27. § Mercur. art. gymn. l. i. c. 7.

“ free from all offices, either civil or public; and
 “ we injoin, that, in the provinces, they entertain no
 “ strangers, nor discharge any office; that none sue
 “ them at law or abuse them; and whosoever
 “ does, let him suffer what punishment the judge
 “ shall think proper to inflict *.” Nor was it a
 new thing to honour this salutary profession with all
 the above favours. For before that, the Emperours Ve-
 spasian and Hadrian had directed, that an exemption
 from entertaining of strangers should be granted by
 princes to physicians and philosophers †. Moreover,
 Antoninus Pius had ordered physicians to be exeemed
 from all civil and public offices ‡. And after all these,
 Julian, who, had he not stained his character by his
 implacable hatred to the Christians, might justly
 be reckoned among the wisest of the emperours, not
 only gave an honourable testimony of the utility of
 our art, but ratified by law the decrees of former
 princes relating to physicians, and freed them from all
 court-services ||. But enough has been said of medi-
 cal affairs, among the people who were lords of the
 universe.

If we consider the times, and as it were the differ-
 ent periods of medicine, the thread of our discourse
 carries us now to the Arabians, who cultivated the stu-
 dy of letters at the same time with that of war. For
 in those ages, in which barbarity had over-run all other
 nations, the knowledge of the art of medicine was pre-
 served among them. The medical annals are indeed de-
 fective as to this point, and what the historians of that na-

* Leg. 6. cod. de profess. et med.

† Leg. ult.

‡ ult. ff. de mun. & hon.

‡ Leg. 6. §. 2. ff. de excusat.

|| Vid. Julian. epistol.

tion have recorded of physicians being enveloped in the difficulties of their own language, is concealed in the presses of libraries, but may some time or other perhaps be brought to light. We may observe, however, by way of specimen, from their records, which are not published, that the annual salary of the emperor's physician was fifteen times an hundred thousand drachmæ * ; which, if reduced to our money, amounts to more than 30,000 pounds. Any one may say, that this generosity of their princes was prodigious, and scarce credible. But physicians were not only the ministers and counsellors of the Arabian kings, but likewise connected with them by intermarriages ; and the revenues of lands, and governments of cities, were often given them as the reward of their labours.

Afterwards when, upon the revival of letters, the ancient fountains of learning began to be opened, and the study of the sciences to be warmly carried on, first in Italy, and then in other countries of Europe, medicine obtained different honours among different states ; and as arts are cherished by glory, so that of medicine has always repaid the favours conferred upon it, by the greatest services to the public. It would be tedious to explain the privileges and immunities of the schools of Salernum, Boononia, Padua, Mount

* *Osaibea de vitis medicorum, ms. Arab. Drachmæ autem hic non Atticæ, sed Arabicæ intelligi debent ; quantum hæc, si Golio credamus in Lex. Arab. tertia parte illis sunt leviores. Nec longe discrepat Gravii sententia, qui, ex comparatione cum granis nostris discrimen petens, veterem Atticorum drachmam grana 67. Arabicam vero $47\frac{4}{5}$ exæquare statuit. Vid. Greaves's discourse of the Roman denary, p. 61. 115.*

Pessulanus, Paris, and many such. I mention however with pleasure, that as medicine has no where been more honoured than among ourselves; so no college (I would not incur envy by the expression) has been more fruitful than ours, in men of the greatest genius and learning.

Here a large field of discourse opens to our view; but the task enjoined warns me not to spend the little time, sacred to the memory of the great patrons of the medical art, in the commendation of physicians only. Let foreigners rather declare, how much they have profited in the study of physic, by the labours of the English. But why should I not mention that it has been our good fortune, that those very persons who have shone as eminent lights in this salutary science, are celebrated as the authors and guarantees of our dignity? Can any name a wiser man or more accomplished scholar than Linacer, who, in the reign of the invincible Henry the Eighth, first secured us by royal authority? Is there any better skilled in this art than Caius, who added the appendages of power to our ornamental honours? Can we find a match to Harvey, in point of acute parts, and the knowledge of nature, who enhanced our power by his donations? These, after the manner of the ancient philosophers, leaving their native country, went to different climates, especially to Italy, that ancient seat of the muses, where they not only carefully imbibed all sorts of sciences, and introduced them into their country; but, what is still more, they contrived the form of a medical republic, whereby the several professors of that art might be united as members of the same body. The sciences are social,
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and concord is the principle which forwards and promotes them. Hence, one after another, as it were by turns, corroborated this fraternity by laws and statutes; they recorded their performances, and instituted a solemn entertainment, at which honourable mention was made of their patrons. Live for ever, ye illustrious names! your praises shall remain while medicine is in repute; and this it must be a while a care of themselves affects mortals, and while the nature of men prone to luxury and licentiousness, renders them obnoxious to diseases. I should be highly to blame, if I passed over in silence others who are rivals for the same commendation; viz. Caldwell, Gulstone, and Crony, who, by large donations, promoted the study of chirurgery. Nor must I omit Hamæus, who when alive, furnished us with those buildings, and at his death bequeathed to us his estate. As the motives to virtue, particularly that kind of it which is subservient to the public utility, are great among good men; so this remarkable liberality of physicians, and generous zeal for promoting the common good, has brought in others, eminent both for their birth and parts, to a share of the same praise. Nor have the female sex been wanting in promoting the honour of an art to which their delicate frame makes them often have recourse. Therefore Arabella Stuart, and Mary Countess of Salop, these ladies of honour, and descended of the royal line, have given large donations for defraying the charges laid out in purchasing our buildings. With these I will join these two noblemen, John Lord Lumley, and Henry Marquis of Dorchester. The former jointly contributed with the above-mentioned Caldwell, and the latter so highly

esteemed us, that he not only presented us with an excellent library, but wanted to be of our number, to attend our meetings, and strenuously to practise medicine. How happy is the omen, when we can congratulate ourselves, that a nobleman illustrious by all the appendages of dignity, and yet more so by his magnanimity, has added the honour and splendour of his name to our records!

I will proceed no further, thus to fully by my sorry genius the praises of those great men, which the voice even of the greatest orator is not sufficient to celebrate. The examples of humanity and knowledge which you, most accomplished colleagues, daily show, will consecrate their memory far better, than the warmest breath of an oration. For while you tread their steps, you renew a daily monument of praise and prudent counsel, and exhibit a perpetual testimony of pains well applied. Who beholds our most illustrious præses, supporting with resolution and prudence our authority, and does not immediately represent to himself Linacer's wisdom? Who makes acknowledgments to the censors for restraining the destructive boldness of those unskilled in the art, and providing effectually against frauds in the composition of our medicines? Who commends the quæstor's fidelity and œconomy in managing the treasury? Who has a great veneration for all of you, that are sincerely looking after the safety and health of your countrymen, and beholds you adorned with riches and honours suitably to your merits? I say, who does all this; and does not at the same time honourably mention, and extol with the highest praises, the benefactions of those who first laid the foundations of this science,
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and erected these buildings? Go on then, my illustrious colleagues, and prosper with your wisdom, proceed in the path you have begun: for thus shall you transmit to your sons the light of praise and life, and they again to your grandchildren; who, following the examples of their ancestors, shall preserve the privileges, the honour and dignity of this society, which I wish may, and I prophesy will continue throughout all ages, and shall leave those buildings to their posterity in good repair.

The constitution of the college for the study of the liberal arts and sciences, and the manner of its government, are subjects of great importance, and which I shall now endeavour to explain.

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A Letter from Dr RICHARD MEAD to Dr
JOHN FREIND.

I AT length acquit my promise, my dear friend, and send you the method I observe in curing the small pox ; together with some cases which illustrate and confirm it, which you requested me to put in writing.

Our discourse, as far as I remember, turned upon this disease when it is at its greatest height, and upon the regimen proper for the patient at that time. I then told you, that, in most cases at least, I found, by several years experience, the keeping the belly open to be extremely proper ; now I shall briefly describe for what purpose, and with what care I first practised this.

The consideration of the pustules for the most part so much ingrosses the attention of our physicians, that they look upon every kind of evacuation as dangerous, and as having a tendency to interrupt the concoction of the corrupt matter, or to hinder the pushing of it into the proper parts of the body.

Sydenham places all his hopes in the swelling of the face and the hands ; and yet nothing is more ordinary than the death of those whose skin is swelled to the highest pitch ; nay, he himself acknowledges, that the promoting of this salutary swelling in many cases is quite impracticable.

Morton, while he is entirely for joining the animal spirits with the morbid matter, so combats against the deadly enemy, with his hot antidotes, these auxiliary forces of his forsooth, that he raises new troubles in the blood, and increases the fever he ought to check ;
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and the histories he brings, plainly show that most of the patients he attended, have either been killed by too much heat, or have escaped as it were by fire.

The case seems to stand thus : In the regular confluent small-pox mentioned by Sydenham, when now the disease wearing off, the swelling of the face is assuaged, from the corrupted matter, or not yet turned into pus, or from the pustules thrust back into the blood, a putrid fever arises, discovering itself by heat, want of rest, and other such symptoms, which, if not cured, in two or three days generally finishes the patient ; sometimes however it continues longer.

But however present or succeeding symptoms may differ, all affected with this distemper need some evacuation. It generally happens, that in nine or ten days after the first eruption of the pustules, the patient becomes warm, and the tongue is rendered dry by the vehement beating of the arteries, and the difficulty of breathing ; on these emergencies, having applied a clyster in the evening, next day I loosen the belly with a gentle cathartic potion, and at night give a narcotic draught, if necessary.

In this disease the hands and the feet swell ; but purging is so far from checking or stopping this, that I have always observed it succeeded the better for it.

It frequently happens, especially in the worst kind of this disease, that the patient falls into a fever, which is attended with a small or languid beating of the arteries, without any remarkable swelling of the hands, and the patient is rather benumbed than scorched with heat, his strength being greatly impaired.

In this case, blistering plasters are to be applied to the

the arms and the legs; nor are purgative medicines entirely to be neglected, but care must be taken that they be gentle, and suited to the strength of the patient, and that some time intervene betwixt each dose; for the keeping the belly open is so much the more necessary, when the parts are not swelled, as, in most cases, the putrid matter which is in the pustules, in a great measure is not turned into pus.

In general, we may observe, that greater regard is to be had to the strength of the patient than to the pustules; by this time all the pushing of the morbid matter through the skin is over; therefore the noxious humour, which threatens danger, must be carried off by other methods. Now, the salival passages do not act their part, and the viscid liquor which flowed in great abundance through them, almost from the beginning of the disease, sticks and can scarce be got up. If the voiding of urine happens to have been for some days large and free, yet even this, at that time, comes off with difficulty, and in a less quantity than usual. It remains then to cleanse the glandules of the intestines, which are the more adapted for draining the blood of corrupt humours, as they naturally drive off any gross lentor.

This caution ought to be given, that not only at this time, but every day of the disease, the patient is to be let blood, if troubled with a difficulty of breathing, or in case of a delirium, or of any other symptoms of too much feverish heat.

Of the innumerable examples which daily experience furnishes me with, I shall only select a few, in order to point out how this medicine is adapted to the various and most difficult cases.

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The head and hands of a youth about sixteen years of age, on the ninth day of his illness, swelled prodigiously; this swelling was accompanied with a fever, with great heat in the lungs, an asthma and delirium. After letting blood at the arm to the quantity of $\frac{3}{4}$ xvj, I gave pil. ruff. 3 fs. and ten hours after, as the belly continued obstructed, I administered a lenitive electuary 3 vj; being largely purged, he took an alleviating draught. Hence the fever was so much abated, and the symptoms so greatly lessened, that in a short time he recovered beyond expectation; the disease however was so severe upon the poor youth, that the hard tunic of both his eyes being vitiated by the pustules, he lost his sight, and consequently the pleasure of life.

In one or two young men distressed in much the same manner, I happily found that this medicine was not to be omitted, even though many excrescences should break out in the intervals of the pustules, and terrify the spectators on account of their malignity, which is often the case; for these do not ease the fever, but indicate plenty of morbid matter, and lentor; wherefore it is the more necessary often to relax the belly, some time intervening betwixt every application made for this purpose.

In a girl five years old, there appeared among the pustules, from the first days of her illness, purple and livid spots here and there; her hands swelled on the ninth day; on the tenth she was purged by means of a lenitive electuary: next day her forehead, which something like a white bladder covered, was discoloured with blueness. I ordered it to be fomented with
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the spirit of wine warmed, and every night procured her sleep by a dose of opium; on the fourteenth day, when for the first time the swelling of her hands abated, I again gave her physic, as also on the sixteenth day. Now the black scurff which irritated her face, began to open, and though it burst but slowly, yet afforded certain hopes of recovery.

It happens sometimes, though seldom, that, towards the end of this illness, the disease, as it were, increases and revives, new pustules succeeding under the scurf with which the skin was covered; whence, by reason of the abundance of moisture, the malady continues more than twenty days. This I lately observed in a lady of quality about forty years of age, who, being in a good plight of body, supplied matter for the small-pox which seized her three several times. This occasioned a continued exulceration over her whole body, scurfs appearing even to the 28th day, so that the ulcers in the loins, as she had been so long ill, made me afraid of a gangrene. On the 12th day I gave her a gentle dose of physic; on the 15th the swelling of her hands, which had continued to this time, being abated, I found it necessary to repeat the same; this every third or fourth day I continued to do, till she had got the better of the distemper; and thus, after a lingering illness, was her ulcerated body made whole.

Nature herself sometimes removes all manner of doubt with respect to the necessity of purgation, while she thrusts downward all noxious matter, the flux of the belly continuing for several days: when this is the case, the belly is in such manner to be astringed

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stringed and loosened, that too great evacuations may not waste the strength. By this method lately a young nobleman of eighteen years of age recovered : his face on the sixth day without any swelling resembled a piece of parchment ; and as there were no signs of suppuration, I applied blistering plasters, which extracted more moisture than usual. On the ninth day, the hands not at all swelling, he was seized with a flux, which rhubarb taken often with Fracastorius's confection in a great measure stopped, yet so as that the patient evacuated a little three or four times a-day ; on the fourteenth day the membrane bursting on his face, the skin underneath appeared to be corroded with thin gore, the scales did not quite disappear before the twentieth day ; the flux however continued in the way I have described.

Now to conclude, I have scarce ever seen any grievously affected with this disease escape, unless upon the decline of the fever their cure has been effected by a plentiful flow of urine, or an open belly. Not to speak of children, who generally are freed from danger by having their bellies kept lax during the whole time they labour under this disease.

These are the things, very learned Sir, I had to communicate to you upon this subject ; which I incline you should so use, that while you weigh these reasons of mine with your great penetration, you would also consider of what importance they may sometimes be in other fevers, which are cured slowly and with difficulty. I can for my own part freely aver, that this practice has succeeded so well with me, that I think it for the interest of the human

race, it be published. But as to this determine as you please; suffice it for me that I have complied with your desire, and by doing so have shown how much I value your commands. Adieu. Continue your affection to your most sincere friend.

Sept. 1. 1716.

A D V E R T I S E M E N T.

* * * The preceding translation of Dr Mead's oration in honour of Harvey, and of his letter to Dr Freind, has been made chiefly for the use of those gentlemen who may be at some loss to understand the original. We are sensible that such a translation, however well executed, cannot fully display the beauties of the Latin original; but hope it will be found clearly to express the Doctor's meaning. As the several pieces originally wrote by the Doctor in Latin are translated in this edition, it was thought proper also to give a translation of the oration and letter. Mean time those who understand Latin, will no doubt chuse rather to read the original, than the translation.

The End of the FIRST VOLUME.



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